UNIVERSITY STUDENTS' PERCEPTIONS OF NEUROLOGY AND EXPERIENCES OF LEARNING NEUROLOGICAL PHYSIOTHERAPY.

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ABSTRACT

The education of healthcare professions students in the effective management of people experiencing neurological conditions is essential. If physiotherapy students' are experiencing neurophobia, the fear of neurology (Jozefowicz 1994: 328) it is important to understand the underlying reasons, to inform future teaching practice. The purpose of this research was to explore physiotherapy students' perceptions of neurology and their experiences of learning neurological physiotherapy in one UK Higher Education Institution (HEI).

This mixed methods case study was conducted with all pre-registration physiotherapy students on the BSc and MSc programmes at the participating institution. The research consisted of an initial survey questionnaire to all students, followed by observations of neurology teaching sessions and interviews with students from each of the 3 BSc and 2 MSc year groups. The data was analysed using thematic analysis.

The results suggested that students' perceptions of neurology and neurological disability were set long before they commenced on the programme and these preconceptions impacted on subsequent learning experiences. The students in the study unanimously felt that learning neurology was difficult. There were also concerns expressed about the pressure of an inherent perception of the high importance of the physiotherapist's role in the rehabilitation of neurological patients, with the outcome of treatment having a life-changing effect on patients and their families.

The students' experiences of learning neurological physiotherapy was challenged by difficulties conceptualising new neurological knowledge, learning a new approach to patient treatment, and the complexities of performing neurological physiotherapy clinical reasoning. This learning was also influenced by the methods of teaching taking into account the informal and non-formal learning along with the formal, and most significantly the lack of experiential learning with patients during the university based teaching.

The implications from this research can inform changes to the pedagogy within neurological physiotherapy and the wider programme content.

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Terms

Bobath

A movement therapy approach for patients with upper motor neuron lesions, named after the founder Bertha Bobath, developed in the post war years (Lettinga 2002). “The contemporary bobath concept is a problem-solving approach to the assessment and treatment of individuals with disturbances of function, movement and postural control due to a lesion in the central nervous system” (Raine et al 2009). The basis of the approach is neurophysiological and the aim is to restore normal movement using facilitation (Lennon 2004).

Formal learning

Institutionalised chronologically graded and hierarchically structured educational system (Nelson et al 2006).

Informal learning

The lifelong process by which every person acquires and accumulates knowledge, skills, attitudes and insights from daily experiences and exposure to the environment (Nelson et al 2006).

Movement Science /Motor Re-learning

A treatment approach in neurological rehabilitation that regards the patient as an active learner (Van Vliet et al 2001). The basis of the approach is motor learning and biomechanics. The aim is to re-educate everyday activities with an emphasis on cognitive guidance and practice (Lennon 2004).

Non-formal learning

Any organised, systematic, educational activity carried on outside the framework of the formal system to provide select types of learning to particular subgroups in the population (Nelson et al 2006).

Researcher Reflexivity

Researchers’ are reflexive when they are aware of the multiple influences they have on research processes and on how research processes affect them (Gilgun 2010) .

Abbreviations

BSc	Bachelor of Science
CSP	Chartered Society of Physiotherapy
CVR	Cardiovascular and Respiratory
EBL	Enquiry-based learning
HCPC	Health and Care Professions Council
HEI	Higher Education Institution
ICF	International Classification for functioning, disability and health
MSc	Master of Science
Msk/MSK	Musculoskeletal
Neuro	Neurology
PBL	Problem-based learning
RCP	Royal College of Physicians
WHO	World Health Organisation

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INTRODUCTION

The training of healthcare profession students in the effective management and treatment of people experiencing neurological conditions is essential, and the role of physiotherapists in the management and rehabilitation of neurological problems is vital. There are approximately 10 million people in the UK, 8 million in England living with a neurological disorder which impacts on their lives and each year 600,000 people (1% of the UK population) are newly diagnosed with a neurological condition (Neurological Alliance 2003). It is estimated that 350,000 people in the UK need help with their activities of daily living because of a neurological condition, and 850,000 people care for someone with a neurological condition (DOH 2005). Many of these people will be, or should be benefiting from the services of physiotherapy. It is therefore essential that the teaching and learning of neurological physiotherapy within university is effective in preparing students for the role of the qualified physiotherapist working in neurology.

Professionally, physiotherapy aims to restore movement and function when someone is affected by injury, illness or disability (CSP 2013), and physiotherapists specialising in Neurology are trained to specifically understand and treat the symptoms of presenting problems that originate within the brain and nervous system (Stroke Association 2012).

As a lecturer in higher education teaching on healthcare professional programmes, my primary focus is to support the development of individuals into knowledgeable, skilled, caring and compassionate professionals who will deliver high quality physiotherapy care. The teaching methods used to facilitate this learning are varied in an attempt to meet the needs of all the students. It is important to have a good understanding of the students' experiences of learning neurological

physiotherapy to identify any challenges to learning. This might include problems with the assimilation of knowledge, decision making and clinical reasoning skills, or application of the physiotherapy management. This knowledge will inevitably lead to future pedagogical improvements to the teaching block and potentially influence physiotherapy education in the wider context.

If physiotherapy students' are experiencing neurophobia (Jozefowicz 1994:328) a fear of neurology, as is the case for many medical students across the world (Schon et al 2002, Flanagan et al 2007, Youssef 2009, Sanya et al 2010, Zinchuk et al 2010, Hudson 2006), it is also important to understand the reasons for this in a physiotherapy context in order to help prevent and reduce this fear through supportive and effective teaching methods.

My experiences and observations suggest that many physiotherapy students initially demonstrate anxiety about learning neurology. At the participating HEI the BSc physiotherapy students learn their basic neuroanatomy and physiology in their first year of teaching, and learn about the neuropathologies and neurophysiotherapy practical assessment and treatment skills in their second year of teaching. The students generally experience their neurology clinical placements at this time but it may occur in the third year dependent on availability. In contrast the MSc physiotherapy students learn their neurology through Enquiry based learning (EBL) in the second year of their 2 year programme. It is apparent in both programmes (through module student feedback and from personal experience) that many of the students find neurology a difficult subject to grasp. The reasons for this phenomenon remain unclear. Literature to explore physiotherapy students' acquisition of neurological knowledge and skills, their experiences of learning neurology, and any assumptions about the topic is currently very limited and therefore warrants further investigation.

This thesis reports the research I conducted exploring physiotherapy students' thoughts, feelings and experiences of learning neurological physiotherapy at the participating university. The research included a survey questionnaire of all physiotherapy students, followed by observations of neurology teaching and interviews with students from all years in both physiotherapy programmes.

THESIS CHAPTERS

Chapters 1 and 2 provide the background and purpose for the study, along with a review of the relevant literature. Chapter 3 discusses and justifies the research methodology and methods. Finally, Chapters 4 and 5 give the critical analysis of the data collected and Chapter 6 concludes and makes recommendations for the future.

1.0 BACKGROUND TO THE STUDY

In order to provide a backdrop for the discussions that ensue through the literature review and discussion of results, it is necessary to define the field of neurology, neurological physiotherapy, and the current structure of university based healthcare professions training with a particular focus on the neurology components.

1.1 WHAT IS NEUROLOGY?

There are a number of specialities that healthcare professionals are required to learn about as part of their curricula, and even more speciality options post qualification. The Royal College of Physicians (2013) in fact states that there are over 60 medical specialities. For the medical students therefore, there are numerous specialities and subspecialties to learn. In Schon et al's (2002) study which looked at making neuroscience more accessible for medical students, the questionnaire referred to 7 medical specialities: Cardiology, endocrinology, gastroenterology, geriatrics, neurology, respiratory medicine and rheumatology. This was referring solely to the medical speciality which is just one area of doctors' practice. The numbers and scope of areas of practice are delineated differently for different professions. Contrastingly the Physiotherapy curriculum is developed around just three core areas of practice; Musculoskeletal, Cardiovascular and Respiratory, and Neurology, although it should be noted that these also incorporate a number of subspecialties. For example women's health will be taught under the umbrella of musculoskeletal. It would appear from this illustration that neurology is a larger area in the overall practice of physiotherapists than doctors because the doctors' curriculum will cover many more specialities than physiotherapy. The length of training also differs as the medicine programme is 5

years rather than 3. It is important to recognise these distinctions when attempting to discuss physiotherapy student experiences in the light of medical student research.

Neurology is the branch of patient care that is concerned with the functions and disorders of the nervous system: the brain, the spinal cord, and the nerves (CSP 2002). Within neurological practice there is specific critical analysis required to determine the site and nature of the neurological damage (RCP 2013). There are a number of neurological conditions which will cause damage to the nervous system. The National guidelines for long-term neurological conditions have defined these as;

- “Sudden onset conditions (e.g. acquired brain injury of any cause (including stroke), spinal cord injury
- Intermittent conditions (e.g. epilepsy)
- Progressive conditions (e.g. multiple sclerosis, Motor neurone disease, Parkinson’s disease, and other neurodegenerative disorders)
- Stable conditions with/without age-related degeneration (e.g. polio or cerebral palsy)” (Royal College of Physicians 2008:2)

The medical definition of Neurology “is the speciality encompassing the diagnosis, investigation and long term management of adults with neurological symptoms and diseases” (Royal College of Physicians 2010:1). This definition is all encompassing of the management of neurological patients from the presentation of initial symptoms through the diagnosis, rehabilitation and support at end of life. The role of the consultant neurologist and the neurological physiotherapist differ in their approach to the management of neurological patients and will have differing affects at various stages of the management. The neurologist will have a primary role in diagnosis, investigation and drug therapy whereas the physiotherapy role is

more significant during the rehabilitation stage to maintain or regain physical function. The types of patients being treated will also be different; the neurologist will be managing migraine and epilepsy (Neurological Alliance 2003) for example which do not routinely require physiotherapy input, as the majority of these patients do not have movement related problems. Even accounting for the interdisciplinary approach to health education, the training of medical and physiotherapy students will be inherently different to account for these disparities. It is again important to bear this in mind when attempting to translate findings from medical literature to the experiences of physiotherapists.

Interprofessional and interdisciplinary education is vitally important particularly in the management of neurological conditions because of the integrated teams that are required to manage such patients in practice. This is evident in the National guidelines for long-term neurological conditions (DOH 2005) and the National Stroke Strategy (DOH 2007) where it asks for coordinated multidisciplinary team interventions.

Patients and clients experiencing neurological conditions encounter varied symptoms as a result of the damage to the nervous system. This damage might be caused by a Head Injury, Multiple Sclerosis, Parkinson's Disease and Cerebrovascular accident (CSP 2005) to name but a few of the most commonly treated neurological conditions by physiotherapists. Primarily the physiotherapist would be involved in the management if the patient was experiencing difficulties with physical functioning and mobility. The numbers of people experiencing neurological conditions is vast, as previously illustrated above. The resultant symptoms of these neurological conditions requiring treatment can include motor, sensory, cognitive, psychological and perceptual problems (Mercier et al 2001, CSP 2002). It is essential that all elements be considered holistically taking

account of the person's social context, in order that health professionals treat neurological patients effectively (CSP 2002). All of the above problems could influence the person's ability to move and therefore would benefit from physiotherapy input.

In medicine it has been documented that there is a global shortage of neurologists (Menkin et al 2000) and there are concerns that there is increasing demand on the few neurologists that are available (Youssef 2009) It is suggested that there are 600 neurologists in the UK and their roles have changed since the number of hospitals beds has been reduced, so that they work much more in primary care outpatient clinics (Ridsdale 2009). There is also currently inequitable access to a neurologist across the UK with the best access being in the London area (RCP 2011). It has been suggested the number of posts needs to rise to 880 to account for 1 consultant neurologist per 70,000 populations (RCP 2011). This picture is complicated by the changes that emerged in neurology where elderly care physicians took on the care of stroke, epilepsy and Parkinson's disease and psychiatrists took on epilepsy with learning disabilities and dementia, leaving just the rare conditions to the neurologists (Ridsdale 2009). These changes were not echoed in the physiotherapy world as the neurological physiotherapist continues to treat the relevant neurological patients regardless of their referring consultant. The location of care has however seen a change in recent years with acute care being delivered in specialist wards for example stroke units and many more patients being discharged earlier to be supported in the community.

The global burden of disease study provides evidence that neurological disorders are priority health problems worldwide (Menkin et al 2000), and it is predicted that stroke alone (as just one of the neurological conditions) will account for 6.2% of the total burden of illness in 2020. On the whole, the Neurology Atlas produced by

the World Health Organisation (2004) indicates that resources for neurological disorders are insufficient when considered in the context of the known significant burden of the disorders. It is therefore important that the management of neurological conditions is achieved effectively and efficiently, for the benefit of the patient, the service and the cost to the economy. In order to achieve this, healthcare professionals need to receive the appropriate education to be prepared for clinical practice in this area.

Healthcare degree courses in higher education are vocational. This makes them distinctly different to many other university courses, in that students need to learn professionalism as well as acquire the profession specific knowledge. This professional socialisation process includes many elements such as, the norms and values of the profession, the development of professional identity, technical skills and knowledge, and the capacity to make clinical decisions (Ajjawi and Higgs 2008). This forms part of the physiotherapy curriculum alongside learning the core areas of physiotherapy. It is important to remember that this process is also occurring as the students progress through the course and may have an influence on the ordering of the subjects that are being taught. This process is also particularly pertinent in light of the findings from the Mid Staffordshire NHS Trust Public Inquiry (Frances 2013), which highlighted a number of failings including a number of professionalism issues, in particular the lack of compassionate care.

1.2 PHYSIOTHERAPY EDUCATION AND LEARNING NEUROLOGY

The structure and content of the physiotherapy programmes is designed by the teaching team and reviewed by the Health and Care Professions Council (HCPC), the Chartered Society of Physiotherapy (CSP), the University monitoring and review processes, and the regional Performance and Quality Assurance

framework (PQAF). All Universities can individualise the chosen structure and content of their programme within the requirements of the above quality assurance bodies.

At the participating HEI the physiotherapy curriculum centres on the 3 core areas of physiotherapy practice; Musculoskeletal, Neurology and Cardiovascular and Respiratory (CVR) however the structure of the BSc and MSc programmes are very different. The 3 year BSc programme attracts predominantly school leavers whereas the MSc programme is a 2 year programme specifically for students with a previous relevant degree of at least 2:1 qualification. The programmes are structured differently to account for the students' different level of academic experiences. The BSc programme offers a variety of teaching methods ranging from didactic lectures to workshops, seminars, practical sessions and some problem based learning. The MSc programme in contrast acknowledges that students will have some critical appraisal skills and be more confident in self-directed learning and uses a solely Enquiry based learning (EBL) approach to deliver the curriculum. There are no face to face lectures. Any lectures are posted as online learning prior to seminars or workshops.

In both programmes the musculoskeletal teaching comes first which includes all the basic transferable physiotherapy tools. In the BSc programme year 2 includes the neurology and CVR content and in the MSc programme the musculoskeletal block is followed by CVR in the first year and Neurology in the second year. The similarities in the ordering of the teaching are evident even though the structure of delivery differs.

The teaching team that delivers the neurology block of teaching is the same on both programmes and the content and learning outcomes are comparable, although they are achieved slightly differently. The neuroanatomy and physiology

is addressed in the BSc programme via lead lectures followed by workshops in contrast to the MSc programme where students work through workbooks and apply this learning during the relevant EBL fortnights. Both programmes receive dissection sessions. The neuropathologies are learned through self-directed study in both programmes, the BSc students work in small groups and are required to produce a fact sheet on a particular pathology. In contrast to the MSc students who are required to learn about the pathologies linked to the EBL independently and then apply this knowledge to the presenting problems. The practical neurological physiotherapy skills are both learned during practical sessions using either paper case studies (BSc) or EBL scenarios (MSc) and are therefore very similar. The number of contact teaching hours is similar although the BSc students do experience additional sessions with the opportunity to interact with neurological patients prior to their practice placements.

1.3 WHAT IS NEUROLOGICAL PHYSIOTHERAPY AND HOW DOES IT DIFFER FROM OTHER AREAS OF PHYSIOTHERAPY

All physiotherapy is concerned with movement, prescribing exercises and treating impairments, disabilities and handicaps. However perhaps more specialised in neurological physiotherapy is the teaching and training offered to the patient to gain or regain function. The physiotherapist analyses the component tasks in movement dysfunction, and uses knowledge of skill acquisition and human movement to plan the treatment strategy. This all needs to occur in the context of the knowledge of the sensorimotor system, motor control theory, motor learning theory, and knowledge of the recovery process- neuroplasticity. The physiotherapist needs to be aware of more than just the physical issues as the perceptual, cognitive and behavioural problems will also impact on a person's ability to perform functional activities of daily living (Baer & Durward 2004).

One of the many challenges for a physiotherapy student as they progress from the musculoskeletal or CVR block of teaching to the neurology block is the potential complexity of the number of body regions involved in the patient presentation. In musculoskeletal practice it is often the case that one joint or body region is affected primarily e.g. in the case of a sprained ankle, or shoulder pain or even back pain. In CVR the physiotherapist is dealing primarily with problems associated with the heart and/or lungs. These patients could present with multi-pathology or the problems could be influencing other areas of the body but there is a clear body region origin. Neurological conditions also have a specific area of damage to an anatomical region e.g. the brain and spinal cord. The difference is that the presenting symptoms requiring treatment could be affecting numerous body regions e.g. one half of the body or all body regions.

According to Marsden & Greenwood (2005:465) there is also the added challenge for physiotherapy students learning neurology because of “the complexity of the interventions” There is a lack of prescriptive techniques or clearly defined protocols for neurological problems, in contrast to other areas of physiotherapy. Elective orthopaedics is an example of one subsection of musculoskeletal physiotherapy that is primarily protocol led because most patients will present in a very similar way before, during and after their joint replacement. Marsden & Greenwood (2005) discuss how the literature discussing physiotherapeutic rehabilitation of stroke patients often favours an approach, namely, either the ‘motor re-learning’ (movement science) or the ‘bobath concept’. These approaches are of theoretical construction, “based on ideas and hypotheses about the retraining of movement that influences the content, structure and aims of the therapy session” (Marsden & Greenwood 2005:466), rather than describing specific techniques. The interventions and techniques used to achieve the therapy

aims are those which are transferable across all areas of physiotherapy e.g. positioning, strengthening exercises, stretches, but they are tailored specifically to the patient. The content of these theoretical approaches are also only taught in-depth at a post-graduate level and are therefore not easily accessible to students. Marsden & Greenwood (2005) highlight that protocols are extremely difficult to devise in neurology due to the wide variation in patient's presentations, and the constantly evolving dynamic approaches. This inherent difficulty to produce prescriptive treatment techniques also provides challenges for the students trying to learn to problem solve and apply neurological interventions.

As Marsden and Greenwood (2005) highlighted above, patient presentations are extremely varied. It is also difficult for students to predict how patients will present because although there will be similarities depending on the location of damage with the central nervous system, every person will respond to this damage in different ways. This implies that no two patients will present the same. This is particularly the case for stroke patients (Stroke Association 2012).

The neurological physiotherapy teaching at the participating HEI promotes a problem solving approach to the management of patients rather than adopting the principles of a theoretical approach such as bobath or motor learning and acknowledges that many of the same interventions/techniques will be used under the umbrella of the theoretical approach. The students are encouraged to transfer the knowledge and skills learned in all of their university teaching and practice placement experiences into neurology and provide justification for these decisions. This transfer of knowledge and skills learned in different contexts is often quite a challenging task for the students. Their previous experiences will have been to learn a specific technique linked to a particular diagnosis or symptom.

A number of challenges have been posed above for the physiotherapy student learning neurological physiotherapy and students' reactions to these challenges warrant further research. There is limited literature available looking at learning neurology or subject specific physiotherapy knowledge but there are some attempts to describe physiotherapists' conceptions of knowledge and the experiences of learning to be a physiotherapist which will be explored in the literature review.

1.4 INTENDED CONTRIBUTION TO KNOWLEDGE

This is a previously under researched topic. This research yields new knowledge about physiotherapy students' attitudes to neurology and their experiences of learning neurological physiotherapy. It provides some understanding of the presence of neurophobia in physiotherapy which can be discussed in relation to the evidence presented in the medical literature. This new knowledge explicitly enhances my role as educator and influences my practice and subsequently the student experience. It is important that any research conducted will make a difference, and the benefits are collective rather than individual. The findings from this research will benefit subsequent physiotherapy students as it will identify issues that can be addressed to improve the overall student experience of learning and practicing in neurology. This knowledge will influence the teaching in the participating HEI and pose implications for teaching neurological physiotherapy in the wider educational arena.

1.5 RESEARCH QUESTIONS

Purpose;

The purpose of the research is to explore the experiences of pre-registration BSc and MSc students learning neurological physiotherapy in one UK Institution.

Research Questions;

- What are students' perceptions of the area of neurology?
    - Do students experience symptoms of neurophobia in a similar way to medical students?
- What are the students' experiences of the university based learning of neurological physiotherapy?
    - What are students' experiences of learning clinical reasoning in neurological physiotherapy?

To provide the background context for the above research questions, Chapter 2 provides a critical look at the pertinent literature exploring the following topics;

- Perceptions of neurology; including neurophobia and views of neurological disability.
- Learning neurological physiotherapy; including changes to pedagogy, clinical reasoning, knowledge conceptualisation and evidence-based practice.

2.0 LITERATURE REVIEW

The literature review undertaken as an essential part of the research process is provided below. A narrative literature review approach was adopted, as is usual practice within qualitative educational research. This ensures that the context was set for the research through an overview of prior and relevant research (Jewell 2011). The literature and research that is included in the subsequent discussion has been selected as relevant to the research questions. Where there was limited physiotherapy and neurology specific research, the search was expanded to include other disciplines and healthcare professions. A summary of the search terms, databases, and the overall strategy employed is presented in Appendix 1, demonstrating that the narrative review was conducted in a systematic manner.

Initially the topics and literature searched were wide in scope.The literature included in this review is that which could help to develop and expand the research questions. As suggested on the previous page (24) the topic subheadings; Neurophobia; and Views of neurological disability, will set the scene for exploring the first question, in the absence of literature looking specifically at physiotherapy students' perceptions of neurology;

- What are students' perceptions of the area of neurology?
    - Do students experience symptoms of neurophobia in a similar way to medical students?

The topic subheadings; Changes to pedagogy in attempt to address neurophobia; Clinical reasoning and professional socialisation; Physiotherapy knowledge, conceptualisation and evidence-based practice; and Theories of learning underpinning the teaching of neurological physiotherapy, will set the scene for exploring the second question, recognising the limited literature that exists

specifically addressing physiotherapy students experiences of learning neurology within university;

- What are the students' experiences of the university based learning of neurological physiotherapy?
    - What are students' experiences of learning clinical reasoning in neurological physiotherapy?

2.1 STUDENT PERCEPTIONS OF NEUROLOGY

There is literature to suggest that medical student perceptions of neurology are often negative and that they fear of the subject. This literature is reviewed in more detail below. It could also be suggested that physiotherapy students experience the same feelings, although there is no research to support this currently. Of particular interest to this study are the origins of this perception and other perceptions of neurology that students may hold. This section of the literature review considers neurophobia and its potential relevance for physiotherapy students, followed by a consideration of society's perception of neurology and disability.

2.1.1 NEUROPHOBIA.

Neurophobia was first described in an opinion piece by Jozefowicz (1994:328) as "a fear of the neural sciences and clinical neurology that is due to the students' inability to apply their knowledge of basic sciences to clinical situations". This was in the context of medical students learning neurology. In addition, it appears that neurology not only has a reputation for being particularly difficult amongst medical students but also for junior doctors and general practitioners (Schon et al 2002). Attempts to define the incidence of neurophobia are evidenced in many countries across the world, indicating that this is potentially an international phenomenon in

medicine. The first questionnaire to investigate neurophobia was designed by Schon et al (2002) in London which was very similar to that used by Flanagan et al (2007) in Ireland. These have subsequently been adopted in research into neurophobia across the world including the West Indies (Youssef 2009), Nigeria (Sanya et al 2010), and the US (Zinchuk et al 2010). There is also evidence of another similar questionnaire used in Australia (Hudson 2006), and discussion of prevention of neurophobia from Singapore (Lim & Seet 2008). The results of these questionnaires have provided some consensus about the medical student's perception of neurology. All the surveys have found that neurology was rated the most difficult of the 7 or 8 subjects identified (Schon et al 2002, Flanagan et al 2007, Youssef 2009, Zinchuk et al 2010, Sanya et al 2010), with most studies indicating that students felt they had the least knowledge in neurology (Schon et al 2002, Youssef 2009, Zinchuk et al 2010, Sanya et al 2010). Flanagan et al (2007) however found that neurology knowledge was also limited but not as significantly, it was only ranked 4th out of 8 subjects. All the students studied felt least confident in assessing and treating neurology cases (Schon et al 2002, Flanagan et al 2007, Zinchuk et al 2010, and Sanya et al 2010). Fascinatingly, neurology was often not rated as the subject students were the least interested in (Schon et al 2002, Youssef 2009). It does appear from the summary of medical student evidence presented that neurology is a subject that students find difficult and therefore might fear, but this does not mean that they do not find it interesting. The fear therefore appears to derive from having to learn the complexity of neurology rather than because they are not interested in or do not like the subject.

The studies discussed above provide a backdrop and context to this study however they are all specific to medical students. In the absence of any physiotherapy research into neurophobia, I had relied on my own experience of

learning neurology and observations of students' learning neurology as a physiotherapy lecturer that suggested neurophobia also exists among physiotherapy students.

It is very important to apply caution when transferring the medical student findings into the culture of physiotherapy students. There are many similarities in the training of specific subjects between the two healthcare professions but there are also many significant differences that could influence the context and transferability of these findings. The most obvious differences, as identified in the introduction, include the length and content for each of the programmes. Physiotherapy can be studied over 3 years at BSc level and 2 years for MSc, whereas the medical students complete a 5 year programme. This is because the content for the medical students is much greater as they need to understand the functions of all the organs and systems in the body. As previously indicated in the introduction, the physiotherapy curriculum centres around 3 core umbrella areas of practice; Musculoskeletal, Cardiovascular and Respiratory, and Neurology. The medical curriculum at participating HEI covers 14 modules (UEA 2013). Examples of areas that medical students learn in much more detail than physiotherapy students includes; the digestive system, blood and skin, homeostasis and hormones, and mental health. It might be argued that if a medical student has a lot more to learn then the more complex subjects such as neurology might be feared as they will take potentially longer to understand.

Developments in the provision of health and social care have seen changes in the management of neurological patients. Many gerontologist consultants are now championing Stroke care and Parkinson's care, whilst psychiatrists manage epilepsy with learning disabilities and dementia, leaving just the rare conditions to the neurologists (Ridsdale 2009). In contrast, all of these neurological patients

would still receive the care of a neurological physiotherapist, although the patient group being treated could be quite specific. There is a possibility that medical students with these developments in mind might associate neurology with the diagnosis of rare complex conditions which could in turn add to their anxiety about the subject. The physiotherapy students may associate neurology with the more common mainstream pathologies such as stroke and consequently may not potentially find this as daunting.

Finally I wish to highlight the differing roles in the management of patients and the possibility that one healthcare professional's intervention could be more complex than another's. The knowledge gained regarding the neuroanatomy, physiology and pathology will be used differently for each profession to plan treatment, and therefore might be perceived more or less daunting. The neurologist will be concerned with the investigations to determine a diagnosis and treatment planning. This could likely involve drug therapy as well as coordinating the team management of presenting problems. The physiotherapist however will be primarily concerned with the problems influencing the patient's ability to move and function. The neurologist will usually have the overall responsibility for the patient and therefore their decision making and clinical reasoning may be perceived the most important.

There is one example of a more qualitative narrative of a medical student's experiences of learning neurology within the literature. A 4th year medical student provides a reflection on his experiences following completion of two four week neurology placements (Giles 2010). Giles (2010) suggests from his own experiences that neurophobia can be reduced through good educational strategies. The discussions of his experiences are focused primarily on the clinical teaching rather than the university based teaching. In comparison to physiotherapy

training, there is greater clinical teaching provided for the medical students. It is unfortunately not discussed whether Giles (2010) would have identified himself as being neurophobic prior to or during his placement experience. I suspect not, as he describes his first neurological placement as being a student selected component in movement disorders, which implies he had an element of choice. He may also be illustrating that his good experiences of clinical education have prevented him experiencing neurophobia. He describes having the clinical time to "gradually build up my examination skills and neurological knowledge at the same time: an integrated approach" (Giles 2010:11). This account suggests that he had the time to make the links which was suggested by the students in the Hudson (2006) study as an improvement required.

It is unclear from his account how he was taught his neuroanatomy and physiology. He describes the 'supported participation approach' to learning clinically that he experienced as being of great value in increasing his skills and confidence. He also reflects on his positive experiences in neurosurgery but within this stated that this was "despite my initial nervousness about the reputed demeanor of neurosurgeons" (Giles 2010:11). It would have been interesting to read an explanation of this statement, what does he mean by this? Do neurosurgeons have a particular reputation or stereotype in the medical field, where does this originate from and does this also apply to neurologists? Certainly Schon et al (2002:559) comments that neurologists have long enjoyed "their subject's reputation as one for which only young Einsteins need apply". Ridsdale et al (2007) also highlights that neurologists' joke that those who fear and avoid the subject maintain that inferiority complex. This appears to be an established stereotype that is not one I have experienced necessarily within physiotherapy. Certainly there are some bobath tutors who practice a particular approach in

physiotherapy in which specific handling skills are used which can be perceived as mystical because the patients have an almost miraculous response. This is not the case for all specialist neurological physiotherapists though so this inferiority complex is less likely to be established within physiotherapy. As a neurological physiotherapist, it is perhaps difficult for me to judge the perceptions of other specialist physiotherapists.

When discussing the neurology teaching, Giles (2010:12) explains that Problem based learning (PBL) had benefitted students as it was a supported environment and neurology was less “intimidating” that way. Unfortunately however he does not establish why it might be intimidating when presented in other ways. One aspect that he highlights is that teaching with patients with rare disorders can be quite intimidating. This resonates with previous survey results which indicated that students felt the least confident when treating non-straight forward neurological patients (Schon et al 2002, Flanagan et al 2007, Zinchuk et al 2010, Sanya et al 2010). Perhaps this is a barrier to learning and patient cases should be kept straight-forward with the most commonly encountered symptoms. Giles (2010:12) suggests five possible points for teachers to consider. The first is to “be aware of neurophobic preconceptions- learning may be disadvantaged at the outset by a negative state of mind”, this implies that there is a pre-conceived view or stereotype of neurology which may be influencing learning. This perception might be started at medical school, as suggested by Ridsdale et al (2007). Alternatively potentially these preconceptions could be created even before the students embark on a healthcare programme. If this is the case, they present wider considerations regarding society’s beliefs about neurological conditions to be explored.

Giles (2010:12) second suggestion is to “support participation with regular teaching slots to build on feedback and track progress”; this suggests that it may take some time for the theory practice links to be established and for clinical reasoning to become effective. The third suggestion is to select more common conditions for initial study”, in doing this theoretically students will become confident in the simpler cases before tackling the more unusual complex cases. In light of the clinical reasoning literature, what Giles might be describing is the cognitive theory of pattern recognition (Jones et al 2000) as a form of forward reasoning, using simpler cases to find patterns of presentations and responses to treatment before embarking on more complex cases. The strategy more characteristic of the novice student is hypothetico-deductive reasoning (Jones et al 2000) where all the possible hypotheses are tested. When this approach is employed it is more difficult and time consuming particularly with the more complex case. If the hypothetico-deductive reasoning approach was reserved only for the more complex unusual cases, then this would be more effective for the student. However, I might argue that even if the common cases are covered frequently in university, the reality of the clinical situation is that even the straight forward cases are initially complex for the novice.

The fourth strategy suggested by Giles (2010:12) is to “encourage student-patient interaction as much as possible”. Again this allows for knowledge to be repeatedly applied from theory into practice and would address the potential issue noted above. The structure of the medical and physiotherapy programmes differs and, even if desirable, this would be more difficult to implement in the physiotherapy curriculum. The final suggestion is to “try to integrate teaching”. This again strengthens the theory to practice links and the clinical reasoning process. Many medical schools already utilise a Problem Based learning (PBL) approach as does

the participating HEI to ensure an integrated experience. The MSc physiotherapy programme uses a very similar Enquiry Based Learning (EBL) approach and the BSc physiotherapy programmes although not currently using PBL or EBL do use a case based approach to teaching neurological physiotherapy practical skills.

In light of the literature reviewed and for the purpose of a working definition of neurophobia for this research tailored to physiotherapy students, I will simply use the 'fear and anxiety associated with the anticipation and experience of learning neurology and neurological physiotherapy'.

In addition to the medical literature discussed above which has attempted to identify neurophobia, there have also been some studies which have assumed this to be the case and have chosen to research teaching methods to reduce neurophobia. These are considered in section 2.2.1, after the next section which focuses on students views of neurology and disability.

2.1.2 STUDENTS VIEW OF NEUROLOGY AND DISABILITY

Literature searching did not revealed any studies exploring physiotherapy students' attitudes to neurology at the commencement of their training. However there has been a study looking at a comparison of occupational therapy and physiotherapy students' attitudes towards people with disabilities (Stachura & Garven 2003). This is of direct relevance to the neurological population when you consider that over 1 million people (2% of the UK population) are disabled by their neurological condition (Neurological Alliance 2003). A student's attitude towards disability may well influence the student's willingness, or fear to learn neurology, and whether they choose to specialise in neurology. Stachura & Garven (2003) used the Interaction with disabled persons scale with additional demographic questions and questions about frequency and contact with people with disabilities.

It was administered at the beginning of the degree course for Physiotherapists (75) Occupational Therapists (63) and education students (30) acting as the control. It was repeated in the final (4th) year of the course (PT 57, OT 25, and Education 30). There were many issues identified with the recruitment of students resulting in different students completing the 1st and final survey and different numbers for each professional group, which needs to be taken into consideration. However the results indicated that Physiotherapy students had the most negative attitudes towards disability on admission, which might be quite surprising considering the profession. The authors postulate that having looked at their application forms they might have a bias towards sports injuries rather than an area working with disability. This sports related profile has a bias towards a view of health as being physically fit and able bodied. It makes sense that these students may find the complex disabilities that a neurological patient might present with quite a challenge.

The Occupational Therapists had the most positive attitude to disabilities at the start and end of the course, although the Physiotherapists' attitudes became more positive as they progressed through the course. It was also noted that the more contact students had with disabled people the more positive their attitude, so this might account for the change in Physiotherapists' attitudes with the additional experience as they progressed through the course.

Early attitudes which are apparent at the start of the course are probably a social construct, a stereotype that those students potentially already possess. In Youssef's (2009:6) study into neurophobia for medical students at the University of the West Indies, one of his concluding remarks was that "perceptions of neurology may have nothing to do with teaching or curriculum but may be the results of societal stereotypes that need to be addressed in a more broad sense as part of

the overall solution". Society's views of neurological patients and the health professions that work with these patients could be influencing our students' readiness to embrace the subject.

It can be suggested that the students commencing the physiotherapy programmes are bringing with them the perceptions of general society. Therefore it is not surprising that they have a bias of knowledge towards the musculoskeletal aspects of physiotherapy rather than the neurological or cardiovascular aspects. In a survey reported by the CSP (2012) it was demonstrated that public awareness of physiotherapy has improved over the past 8 years, although it is clear that the most well-known area of practice remains musculoskeletal. It was noted that the media representation of physiotherapy had achieved greater awareness. Also campaigns such as the FAST (Face, Arm, Speech, Time) stroke campaign may have increased awareness of this pathology and subsequently the management of stroke. Of the public surveyed 61% knew that physiotherapists had a role in stroke recovery and 52% for long term health conditions. I note although, that I would challenge how inconsistent use of some terminology may have influenced the responses. The public may have found it more difficult to understand which conditions might come under the umbrella of long term health conditions. The singling out of stroke as a diagnosis, which could actually also be included in long term health conditions, may have been more explicit and this may have evoked greater understanding. Nevertheless this does demonstrate that the public perception of physiotherapy is biased towards musculoskeletal and therefore many of the students that apply to the course may have been attracted to the course initially by this perception. This is important to remember when discussing their experiences of learning neurological physiotherapy.

2.2 LEARNING NEUROLOGICAL PHYSIOTHERAPY

The study endorses the following definition of learning, how humans “acquire and modify their knowledge, skills, strategies, beliefs, and behaviours” (Schunk 2012:27). The focus of exploration in this study is the students’ experience of acquiring neurological knowledge and neurological physiotherapy knowledge, skills, beliefs and behaviours.

There are numerous factors that can influence the students’ experience of learning neurological physiotherapy. These include the context of learning such as the curricula, teaching methods and the assessment procedures; other contextual factors such as interest, knowledge base and experience; motivation; the effects of courses, departments and institutions; student approach to learning; ability; and poor teaching, (Atherton 2013, Ramsden 2003, Schunk 2012) to name a few. It is outside the scope of the research to review all these aspects and therefore focus will be on some of the pertinent issues influencing the learning of neurological physiotherapy. This section firstly reviews the literature reporting on changes to teaching methods employed in an attempt to address the problems associated with neurophobia (2.2.1); this is followed by a review of clinical reasoning and professional socialisation as important curricula goals of the learning experience (2.2.2); and a review of neurological physiotherapy knowledge, conceptualisation and evidence-based practice (2.2.3). A final consideration of the underpinning theories of learning is given (2.2.4).

2.2.1 CHANGES TO PEDAGOGY IN ATTEMPT TO ADDRESS NEUROPHOBIA

The lack of knowledge and confidence when learning neurology experienced by medical students, as evidenced earlier, has often been referred to in the literature as a fear of neurology, hence the term neurophobia. However it has not been

confirmed in the research that students are frightened of the subject rather than finding it difficult. The complexity of neurology poses particular problems for the students learning the subject, and for the lecturers teaching it. Suggestions for solutions to this phobia in the medical literature have focused mainly on reporting how changes to the pedagogy may influence the incidence of neurophobia rather than exploring the underlying understanding of neurophobia.

Hudson (2006) theorised that if the problem was that students had an inability to apply their knowledge, then perhaps they would benefit from guidance in this integrative process at the beginning of their neurology education. As a result he introduced a case-based teaching approach, in small group tutorials, to attempt to integrate the basic neurosciences and clinical neurology teaching, into a curriculum that was both traditional and utilising Problem Based Learning (PBL). The students had practical OSCE's (Objective Structured Clinical Examinations) to check their clinical competence and 87% of the students completed an evaluation questionnaire administered after completion of this year 3 teaching. The results indicated that 8% of respondents reported no initial fear of neurology however 34% admitted experiencing neurophobia. This represents quite a high number considering the approach to teaching had been changed to reflect previous suggestions that this integrated approach would be beneficial. Qualitative responses were also invited and these revealed that the majority wanted more time to link the neurological clinical skills and the theory. It would have been very beneficial to not only explore the reasons for the neurophobia but also to ask those 8% of students who did not fear neurology, why, to uncover the source of their differing perceptions of neurology. The tutors in this study that were interviewed felt that the difficulty in teaching the subject was due to its enormity and the 'new language' needing to be understood (Hudson 2006:652). It might be argued that if

the tutors are feeling like the subject is enormous and a new language, this perception could be conveyed to the students fuelling their anxieties, rather than employing teaching techniques to introduce the information in a more simplistic and perhaps staged approach.

Both the BSc and MSc programmes at the participating HEI utilise a case-based approach in the teaching of neurological physiotherapy and so one might predict that the physiotherapy students will experience less difficulty in applying knowledge and reasoning, and neurophobia would be less prevalent.

Ridsdale et al (2007) questioned whether neurology teaching was too ‘short’ and ‘unfocussed’, it was highlighted in a US survey that neurology teaching spans 3-4 weeks, with the separation of basic neuroscience and clinical studies. Unfortunately no consensus of length of teaching was available in the UK. The teaching provided is vitally important if as the author suggests, the neurophobia “is likely to develop at medical school, and even be caused by it” (Ridsdale et al 2007:119). The neurology teaching in the London based medical school was changed to allow small groups of 6 students 90-120 minutes weekly teaching over 13 weeks with visiting neurologists. This equates to 4 weeks of teaching but spread over 13 weeks. If the amount of contact time and time between sessions is a significant factor then this is a consideration for this research because within the MSc programme all the neurology and neurological physiotherapy is taught in a 8 week block of 4 EBL fortnights and within the BSc programme the neurological physiotherapy block of teaching is completed within 4 weeks. These are both quite short, intense blocks of teaching which potentially do not allow the time required for knowledge and skills to be consolidated.

The authors adopted Schon et al's (2002) questionnaire with additional questions about the perception of skills and possible postgraduate specialisation as an

evaluative tool. Students perceived their knowledge and skills as comparable to other subjects, although students still rated neurology as more difficult and they lacked confidence in non-straightforward neurological problems. Surprisingly though students rated neurology and cardiology the most interesting of subjects, could this again imply that some students find neurology interesting but also very complex and therefore difficult, and potentially that's just a fact rather than being a problem with the way it is being taught. Both Hudson (2006) and Ridsdale et al (2007) are examples of research in medical education, which does differ from physiotherapy. The neurology knowledge acquired and the application of this knowledge to clinical cases will be different between the two professions and potentially one could be more complex than the other. This may yield different learning experiences for physiotherapy students in comparison to medical students.

There is at least one example in the physiotherapy literature of a change to neurology teaching in an attempt to enhance the experience of students and prevent neurophobia (Watson 1999). Neurophobia is considered in the preamble in justification for the article however the reference to the presence of neurophobia for therapy students is experiential rather than research-based, so its incidence amongst physiotherapy students remains unclear. Watson (1999) describes how Perry's 'Engineers Model' was utilised as a framework for clinical reasoning in the multidisciplinary teaching of neurology. The model suggests that any dysfunction of a mechanism, whether it be a moving device i.e. a car or a human movement, can be understood by identifying in which of the subsystems the problem is occurring. This presents a practical way to break up the complexity of the problems identified in neurology and might facilitate students to apply the basic sciences to clinical scenarios and as such might help prevent neurophobia.

However this is another example of a potential solution to an undefined problem and what is actually needed is to ask the students about their perceptions of neurology and their experiences of learning neurological physiotherapy using a qualitative approach.

Another consideration that has not been explored in any physiotherapy specific literature is the influence of the quality of the neurology teaching, which has been evidenced in the medical literature as influencing neurophobia (Flanagan et al 2007, Sanya et al 2010, and Zinchuk et al 2010).

Two of the above studies (Hudson 2006 and Watson 1999) have provided a method of improving the neurological clinical reasoning, one in the form of presenting the material as a case example and the other by providing a framework in which to organise all the relevant information from a case, thus implying that this is the most significant challenge for the students, learning how to clinically reason in neurology. The exploration of physiotherapy students' experiences of learning neurological physiotherapy will help to confirm that neurological clinical reasoning is part of the difficulty and provide an opportunity to suggest improvements in the context of the this institution.

2.2.2 CLINICAL REASONING AND PROFESSIONAL SOCIALISATION

Giles (2010) asks in his writing that students are given the opportunity to apply knowledge to clinical situations and in doing so is collaborating with many other authors in agreement with the notion first proposed by Jozefowicz (1994) that neurophobia is characteristic of an inability to apply basic sciences to clinical situations. In essence what they are referring to is a deficiency with clinical reasoning. Clinical reasoning is defined as "the thinking and decision-making processes associated with clinical practice" (Higgs et al 1999:13). This topic has

attracted research within the allied health professions field, and clinical reasoning has been explicitly linked to professional socialisation. Ajjawi & Higgs (2008:133) emphasise that “clinical reasoning is a complex skill that is essential for professional practice”. If the process of clinical reasoning is something that is learned during professional socialisation and neurology is such a complex subject, perhaps teaching this in the physiotherapy students second year is too early in this development pathway and for the majority of students the knowledge required to achieve this is too overwhelming. Although the BSc physiotherapy programme is only a 3 year course, therefore it is practical to teach neurology at this stage. This begs the question that perhaps it is the pedagogy that needs to change. The stage of professional socialisation and clinical reasoning efficiency could potentially be made more transparent to the students early in the course so that they are clear about their expectations.

The process of making a clinical decision is a complex one to master. According to Montgomery cited by Nierenberg (2009:285) this is achieved through phronesis: “we listen to and sift through the patients history, organise the patients ideographic datum to form a coherent pattern, use pattern recognition to detect what is missing, make a provisional diagnosis, integrate clinical experience with evidence from systemic research, decide on a focused range of options, weigh benefits and risks of alternative options, negotiate with the patient to find out what is acceptable and achievable, implement a plan of action, wait for the outcome, and adjust treatment as events unfold”. This is written in the context of the doctor however arguably the same applies to physiotherapists as autonomous practitioners. In the context of a physiotherapy student who is learning neurological physiotherapy alongside learning how to clinically reason, we can see how each of the parts of the process identified above will present huge challenges. The physiotherapy

student may not have the knowledge or experience to consider the range of options, or the communication skills to elicit the relevant information and this is the case for all specialities when the student begins. In addition though, the neurological patient could have cognitive or communication impairments that impedes the ability to provide a history or negotiation of plans and goals, which would disrupt the process from the outset and make the remaining process that much more complex. Perhaps this is another aspect that students might be fearful of.

Clinical reasoning is a complex and multi-faceted process which goes beyond the issue of diagnosis. There has been a growing body of literature into healthcare professionals' use of clinical reasoning (Jones et al 2000, Jones et al 2008, Edwards et al 2004, Smith et al 2008), particularly exploring the different approaches between novice and expert professionals (Doody & McAteer 2002, Jensen et al 2000, Case et al 2000, Rivett & Higgs 1995), and to a smaller degree the different clinical reasoning used in different clinical areas (Smith et al 2007). There are very few examples of research that have studied students' understanding and learning of clinical reasoning specifically. Although, one example is a study by Cruz et al (2012) which was specific to physiotherapy students clinical reasoning in musculoskeletal.

Cruz et al (2012) conducted focus groups of final year PT students in Portugal to explore their understanding of clinical reasoning in musculoskeletal. There were 4 themes that emerged as important processes during clinical reasoning; An instrumental process, which viewed clinical reasoning as an instrument or vehicle to make a diagnosis and treatment plan; A clinician centred process, this demonstrated that the reasoning was owned by the clinician and the information from the patient was one input into this; A knowledge dependent process,

highlighting that an in depth knowledge was required to inform decisions and; A context dependent process, indicating that the clinical reasoning would be different for different clinicians, different conditions, different patients and environments.

Each of the 4 processes described in Cruz et al's (2012) study were in the context of musculoskeletal and might not exist in the same way for neurological clinical reasoning. Although it appears these are quite general processes rather than very specific to musculoskeletal so an attempt is given to apply these to a neurological context. This may even give an insight into the aspects that might make neurology appear more complex. In terms of the instrumental process, this would apply to neurology in the same way as musculoskeletal to aid in diagnosis and treatment. One difference could be that the patient comes with a diagnosis made through investigations performed by a neurologist or stroke consultant. In this instance the actual diagnosis may not need to be made by the Physiotherapist but the potential cause of the presenting symptoms may need to be reasoned in order to plan treatment. This reasoning can be difficult when the actual damage is not visible. For example, a patient with a right middle cerebral territory infarct may or may not present with hemi-neglect or spatial awareness issues on the left side. This impairment would need to be assessed by the physiotherapist as this will affect the patient's ability to move and therefore the treatment plan.

The clinician-centred process is perhaps more challenging when managing many of the neurological conditions. The clinical reasoning process is still owned by the therapist. However the reasoning and treatment planning needs to be more patient focused. This is because often the condition is long term or deteriorating so may not resolve and therefore the goals are much more focused around what the patient would like to achieve to improve their quality of life and the best way to achieve this rather than what the therapists sees as the problems, goals and

treatment plan. The negotiation that takes place to establish a shared goal and treatment plan can be quite challenging.

Neurological clinical reasoning is a knowledge dependent process similarly as for musculoskeletal and all areas of physiotherapy practice. Although it should be considered that potentially some aspects of knowledge are more challenging to acquire than others and as previously discussed the acquisition and assimilation of knowledge is often identified as an area of difficulty in neurology. Finally the context for neurological patients could be argued as one of the most complex. In many instances the patient's whole life has been affected by the neurological condition, influencing their family and social network. There are often difficult decisions to be made about prognosis, return to work, and home re-structuring to name just a few. The context and expectation of the therapists is also often very great, as patients and their families place a lot of hope and responsibility with the therapists.

Smith et al (2008) studied clinical decision making processes in acute care cardiorespiratory practice. From experience I suggest this is also an area of physiotherapy which is perceived by students as complex and daunting. Fourteen physiotherapists were observed at work and subsequently interviewed to discuss their decision making. The results highlighted that clinical decision making did involve both hypothetico-deductive reasoning and pattern recognition however the process was far more complex than this. The conclusion was that " decision making in practice is a complex, unique, patient-focused and creative process that is adjusted according to patients' needs into which research findings need to be integrated" (Smith et al 2008:221). This definition does resonate with the processes described in Cruz et al's (2012) study, although the decision making is patient focused it can still be a clinician centred process.

To the best of my knowledge there are no papers looking at neurological physiotherapy clinical reasoning in its entirety. However there are some papers looking at the clinical decision making of specific aspects of management of neurological patients. One such example was reported by Plummer et al (2006) where Australian neurological physiotherapists were asked about how they would diagnose and treat a patient with Unilateral neglect, which is defined as " a complex neurological disorder in which patients fail to attend or respond to stimuli on the side of space opposite a brain lesion"(Plummer 2006:103). One of the most significant differences in the decision making and clinical reasoning process used in this example was the major role of observation in the assessment of the patient. The observation of the patients posture, body parts position, midline, hygiene, patients focus, ability to sustain attention, response to cues, and response to complex surrounding environments, as well as observing functional tasks, all determined how the remaining assessment was organised. It appears that, for this specific impairment, the patient information is obtained more through observation than questioning of the patient, where questioning is used preferentially for other groups of patients. Therapists discussed using a systematic approach with early hypotheses based on information gained from scan results or medical notes.

There was also evidence of a form of pattern recognition in their observations which would determine their subsequent assessment. For example if a patient had a fixed gaze to one side, one arm hanging down to the side, and failed to respond to a voice from one side, unilateral neglect was suspected and this information used to plan the assessment and treatment. This was only apparent when the neglect was severe and therefore easy to observe. In the presence of mild neglect where the deficit was less observable a hypothetico-deductive approach was employed. It was also noted in the study that novice clinicians preferred the use of

hypothetico-deductive reasoning regardless of the early observations. These examples do link to the previous literature suggesting the use of Hypothetico-deductive reasoning and pattern recognition but they do not elucidate about the complexity of the clinical reasoning process as discussed by Smith et al (2008) and Cruz et al (2012). Perhaps this is why the emphasis is on observation because there may be problems obtaining reliable information verbally from the patient. Patients' could be experiencing communication problems, cognitive problems, or lack of awareness and insight. The clinical reasoning process would become more challenging if the patient reports being able to walk but is then observed to be unable to do so for example. This is something that the expert neurological physiotherapist will have experienced and be proficient in accounting for during the clinical reasoning process.

Observation skills as highlighted by Plummer et al (2006) as being essential for neurological physiotherapy clinical reasoning are practiced within the neurological practical sessions. Although the students will be observing each other, and therefore normal postures and movements, rather than the problems patients will present with. For the majority of the students, their first experience of observing neurological patients will be when they go on their neurological practice placement.

An exploration of American expert physical therapists' practice in the areas of geriatrics, neurology, orthopaedics and pediatrics was conducted by Jensen et al (2000) using a grounded theory approach. The analysis of the observations, videotapes, interviews, review of documents and analysis of tasks resulted in a model of expert practice. The model developed includes four dimensions, all of which I might argue are needed in all physiotherapy professional practice. They have been presented here as dimensions of expert practice rather than novice

practice, as would be the case for the student. Only expert clinicians were involved in the research, with years of clinical experience ranging from 10-36 for the 12 peer-designated expert therapists. The four dimensions defined were Knowledge; Clinical reasoning; Movement; and Virtues. Movement and Virtues are the two dimensions identified as more specific to physiotherapy, as knowledge and clinical reasoning are well documented in the clinical decision making and expert literature. It is important to note that the expert clinicians felt the knowledge gained through patient interaction and clinical mentors was the most valuable and that the clinical reasoning was a collaborative process with the patient at the centre. This is important for a lecturer preparing students for neurological practice placements because it appears that the most significant learning of knowledge and clinical reasoning occurs in patient contact rather than in university. Potentially the challenge therefore for university lecturers is to teach the students enough to be receptive to this learning on placement, and not expect the students to be able to learn neurological in the classroom.

As you might expect for physiotherapists, movement was central to practice and was assessed through palpation, observation and manual guidance, which is often so well practiced that it appears 'unconscious'. This highlights again how the students will only experience movement within the spectrum of normal whilst in university, as they will practice on each other. The experiences of dysfunctional movement of neurological origin will be experienced and therefore learned on placement. The fourth dimension 'Virtues' highlights the shared characteristics of the experts studied; they were "committed and caring professionals who hold ultimate respect for their patients" (Jensen at al 2000:41). The authors note the "strong inner drive to succeed and continue to learn" (Jensen at al 2000:41) of the group of experts. It might be argued that this is the dimension that mostly

determines whether the therapist has the passion to develop into a respected expert in their field and that these characteristics also give the motivation to continue to develop in all the other dimensions. This dimension could hypothetically link to the early perception of neurology demonstrated by students, with the students expressing a more positive attitude and perception to neurology and neurological disability, being most likely to choose this as an area to specialise when qualified.

Jensen at al (2000) discussed the interplay between the four dimensions and importantly at the heart of the model is the Conception of practice. This represents what it means to practice physiotherapy, including the physiotherapist's beliefs about their role and how they work with patients and families'. I would suggest that this is relevant to all physiotherapists, not just experts. It is part of the student physiotherapy curriculum to develop the knowledge, skills, attitudes and behaviours linked to all the dimensions identified by Jensen et al (2000) and are part of students' professional socialisation. Later, Jensen et al (2008) use their model to demonstrate how students start with the four dimensions as very separate entities, and as they become more proficient as novice, competent and expert physiotherapists the dimensions become more integrated with each other and an explicit philosophy of practice evolves.

The literature discussing clinical reasoning and clinical decision making is quite varied and it is possible that the numerous models and strategies can become quite confusing. Jones et al (2008) have defined a biopsychosocial model of clinical reasoning as a collaborative process between the physiotherapist and patient, which take into account the WHO (World Health Organisation) framework of health and disability, and is suggested for adoption for physiotherapists. Figure 1 illustrates this.

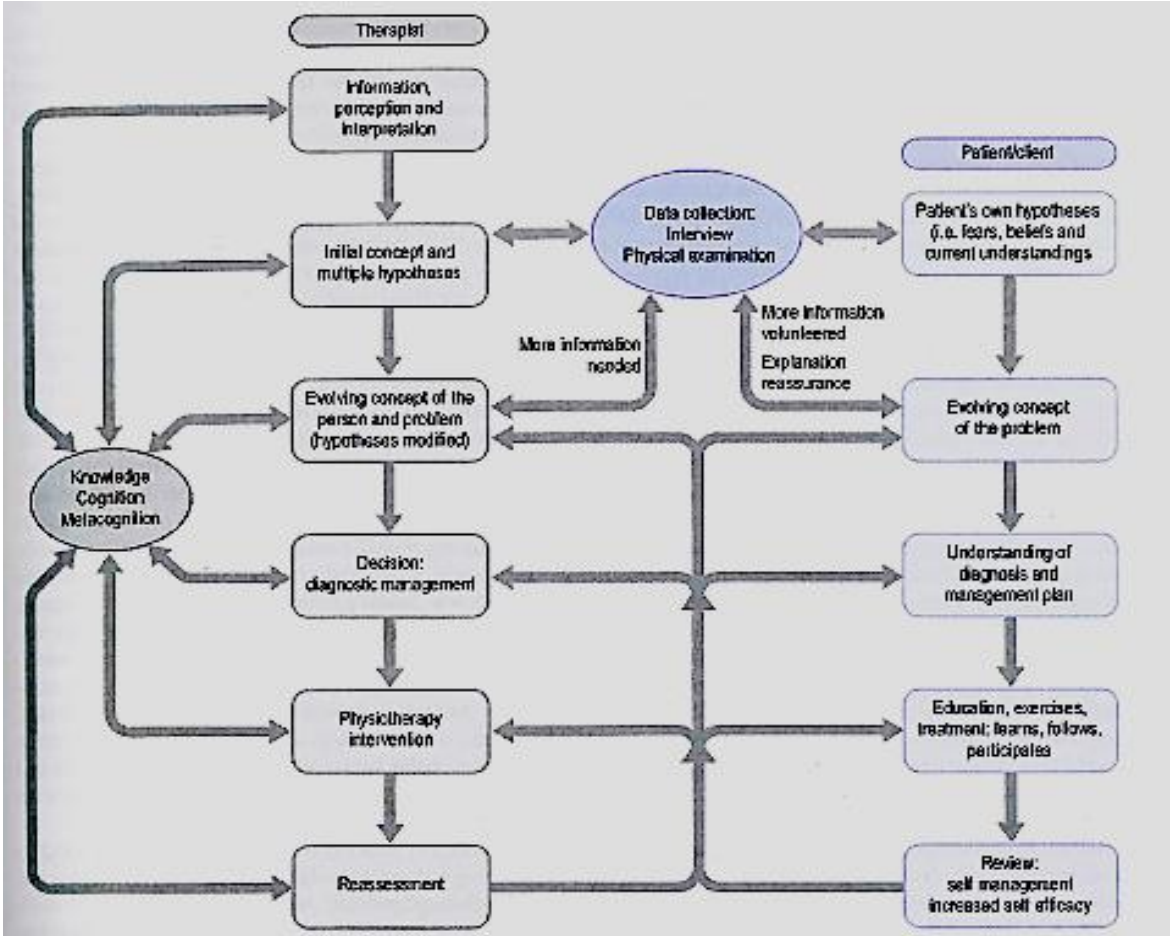


Figure 22.2 Biopsychosocial model of clinical reasoning as a collaborative process between physiotherapists and patients (adapted from Edwards & Jones 1995, with permission)

Figure 1 Biopsychosocial model of clinical reasoning taken from Jones et al (2008:247).

This illustrates a hypothesis-orientated and collaborative process. The key factors influencing the process are the decision-makers knowledge, cognition and metacognition (Jones et al 2008). The knowledge required needs to include underpinning theory both scientific and professional (Jones et al 2008) which is potentially difficult for a student to comprehend in neurology due to limitations in the amount and strength of evidence available. It also needs to include propositional knowledge ‘knowing that’ and non-propositional knowledge ‘knowing how’ (Higgs & Titchen 1995) which ensures the depth of understanding required to make informed decisions. These are in addition to the recognition of your personal philosophy of practice, values and ethics (Jones et al 2008). These values and

beliefs will be nurtured as part of the course and by the point that neurology teaching occurs in the second year of the programmes these values will be well established.

There are cognitive and metacognitive skills which are also required by the decision-maker. The student needs to be able to analyse the information presented, synthesise the information and decide on their strategies to test this information (cognitive), at the same time as being self-aware and using reflexivity (metacognition) to learn from the experience. In essence this will aid pattern recognition, the initial slower novice use of the hypothesis-testing approach will give way to a pattern recognition approach for familiar cases, as learning and refinement of patterns takes place with clinical experience (Jones et al 2008).

Jones et al (2008) also classified the clinical reasoning strategies that were associated with clinical actions, which might indicate valuable strategies to teach students to prepare for the clinical reasoning they will experience in their practice placements. These are categorised as either diagnostic or management relevant. They have been summarised on the following page and critiqued in relation to potential challenges for neurological physiotherapy and the student's learning experience.

Diagnosis	Management
Diagnostic reasoning –The skills and tools for making a diagnosis are taught within university. Although these are practiced on each other and therefore aspects such as patients response to the application of such tools cannot be learned until their practice placement experiences	**Reasoning about procedure** – this refers to the determination and implementation of treatment procedures. This is taught initially in university and will be practiced clinically during practice placements
Narrative reasoning – This strategy is very difficult to develop as a student during role play in university. This strategy seeks to uncover the patients 'story', understand their experience of the problems, what motivates them, and their personal perspectives. The other consideration here is that the narrative is often obtained through verbal communication which may not be possible with some neurological patients.	**Interactive reasoning** – this is the purposeful establishment of therapist-patient rapport. Within university teaching we discuss approaches for how this can be achieved. The reality is that people are so diverse that these interpersonal skills are primarily learned and adapted during clinical experience.
	Collaborative reasoning – this involves the collaboration to devise goals and prioritise of treatment which can only be practiced with the patient and therefore not in university. A potential added complication for some neurological patients could be presenting with perceptual and lack of awareness problems, which means they have unrealistic expectations. This is a challenge for novice students to negotiate.
	Reasoning about teaching – The planning, implementing and evaluation of individualised teaching can only be achieved in context during clinical experience.
	Predictive reasoning – exploring future scenarios and choices for patients is a skill that is introduced during teaching and case based education. The implementation in reality of this will be practiced on placement.
	Ethical reasoning – There may well be ethical dilemmas related to neurological patient's ability to make decisions about their treatment that need to be considered as part of clinical reasoning. Examples such as resource allocation can be discussed hypothetically in university prior to practice placement experiences.

Figure 2 Diagnostic and management reasoning processes in learning neurological physiotherapy.

The clinical reasoning model that I use as a template in this study is that defined by Jones et al (2008), the biopsychosocial clinical reasoning model, as this seems the most appropriate to neurological physiotherapy due to the heterogeneity of the patients' presentations. Also, acknowledging that the strategies above will occur as part of the stages within the biopsychosocial model. This is the most pertinent model for the studies at the participating HEI because the students are introduced very early in their programmes to the biopsychosocial model of health. In the absence of any models or processes specific to the context of students learning neurological physiotherapy clinical reasoning, Cruz et al's (2012) four processes; instrumental; clinician centred; knowledge dependent; and context dependent; defined by physiotherapy students, albeit musculoskeletal, are also used as a template for analysis later in the thesis in light of the research findings, relevant to students' experiences of learning clinical reasoning.

The whole process of preparing for the professional role of a physiotherapist is part of professional socialisation (Ajjawi & Higgs 2008). Importantly this process commences even before the student starts on the professional course because the individual will need to acquire the values, attitudes and interests of the group they seek to be a member of (Clouder 2003 cited in Ajjawi & Higgs 2008). It would be really interesting to ask these potential students about their attitudes to the different subject areas and most significantly neurology, to see if any fear or attitudes towards neurology are evident at such an early stage. The students' perceptions of neurology could be influenced by their previous experiences.

In the development of professional practice, professional identity is essential and drives motivation for further professional development and lifelong learning (Lindquist et al 2006). Interviews conducted with eighteen physiotherapy students in the final month of their university education were analysed to reveal 3

graduating students' professional identities as a physiotherapist, described as an Empowerer who is truly patient centred, working at the participation level of the ICF classification with movement behaviour; an Educator who is patient focused, working at the activity level with movement ability; and a Treater who is physiotherapist focused, working at the impairment level with movement prerequisites (Lindguist et al 2006). It is important to note that the UK students within the study were prominent in the Educator category in contrast to the Swedish students who occupied the Treater and Empowerer categories. This may well be a reflection of the different education systems and healthcare environments. As suggested by the authors, there may be links to learning styles or other relationships with factors that influence types of professional identity. I would have liked to explore how clear the boundaries were between these categories and the potential that different identities could be adopted dependent on what the situation requires. The authors did not discuss a link to students' preference for particular clinical specialities. I wonder if the students with a particular interest in neurology associated their professional identity aligned with the Educator or Empowerer profile, rather than the Treater profile as these would best suit the long term management of the complex neurological patient presentation. The clinical reasoning process and decisions made with neurological patients will be influenced by the profile of the physiotherapist.

2.2.3 NEUROLOGICAL PHYSIOTHERAPY KNOWLEDGE, CONCEPTUALISATION AND EVIDENCE-BASED PRACTICE

It has become apparent that physiotherapy does not have a strongly defined field of knowledge and paradigm which makes the application of theory more difficult (Higgs & Titchen 1995, Pomeroy & Tallis 2003). The physiotherapy students become accustomed to integrating knowledge to justify their interventions, as

providing evidence-based practice is one of the expectations of the students. For example, a particular strengthening exercise could be justified using anatomy, physiology, pathology, physics, biomechanics knowledge to name but a few. The exercise could have some clinical research to critique as evidence and the relevance of the intervention for the individual could be justified through psychological, sociological, environmental knowledge. In the neurological physiotherapy situation there is even less evidence base available than in other areas, although it is acknowledged that this is improving. At best Pomeroy and Tallis (2003) suggest that neuro-rehabilitation is evidence-tinged. They contend that the pressure for evidence-based practice is leading to neuro-physiotherapists changing practice in light of insufficient research evidence.

Evidence-based practice “is a systematic process primarily aimed at improving the care of patients” (Kaura 2013:1), which involves using the current best evidence when making decisions about the care given to each patient (Sackett et al 1996). The strength of the available evidence needs to be determined in evaluating the best intervention. When there is limited evidence at the top of the hierarchy of evidence (Kaura 2013) such as systematic reviews, with more reliance on evidence such as expert opinion, which is suggested to be the weakest level of evidence, determining the best clinical decision can be immensely challenging for students. However engaging in evidence-based practice is an expectation of students’ development of professional practice. The CSP’s Code of members professional values and behaviour states the responsibility of physiotherapists to “use available information and evidence when making decisions” and to ensure their “practice is informed by the professions evolving evidence base”. The amount, type, strength and accessibility of evidence are extremely important in supporting clinical decisions. Students will have less experience and confidence in

appraising the evidence and might rely primarily on published systematic reviews, and in the absence of these, this may add to the complexity of the clinical decision making process.

This leads us to question whether neurology is a complex area of healthcare. Once the students have embarked on the course, there is a vast amount of knowledge and skills to be integrated to make sense of complex patient presentations. Many of the researchers have discussed and concluded that it is the complexity of neurology that the students fear (Youssef 2009, Zinchuk et al 2010) and there is evidence that some researchers have considered this in more detail. Stephenson (2004) has offered complexity theory as a cognitive model for understanding client behaviour and for solving a problem. In order to illustrate this he had chosen a neurological case, a client with a right cerebrovascular accident (CVA), or stroke. The complexity of the case is evident as each of the areas of knowledge required to fully understand the case are broken down and explored. This is done so in the context of interprofessional clinical reasoning with a map of the knowledge base required to manage the case. The example is then further developed and applied as a model of human behaviour. I wonder if you could apply this complexity theory to the subjects studied within medicine or physiotherapy and generate knowledge maps to consider the complexity of different subjects. Would this perhaps illustrate that neurology is really more complex?

If we are to consider how complex different core areas of physiotherapy are, we should first consider how physiotherapy knowledge is conceptualised. There is limited research published in relation to conceptualisation of physiotherapy knowledge. Graham (1996) is one example, using qualitative methods to study physical therapists' processes of developing conceptual knowledge during a

kinesiology course. The analysis of the interviews, observations and journals culminated in three major themes of techniques for learning concepts in kinesiology. These were the use of discussion, use of visualisation, and use of experience (Graham 1996). These processes are very appropriate when studying normal kinesiology, particularly as you can practice movements for yourself. Applying these processes to the learning of neurological physiotherapy is less straight forward, which could be another potential influence on the students' perception of the difficulty of the subject. There is ample opportunity for discussion in neurological teaching, with the lecturers and peers. The use of visualisation and experiences is however more complicated because the majority of students will not have had contact with (experience of) anyone with a neurological condition. The lack of experience makes it very difficult to empathise with the patients and the problems that will need treating, particularly as they are required to role play these situations on each other during practical teaching sessions. The visualisation of symptoms and their origins is also very difficult because, unlike the visible movements that occur when a joint or muscle is moved in kinesiology, the pathways of nerve impulses form the brain and spinal cord in neurology are extremely difficult to track and observe.

Larsson & Gard (2006) have more recently attempted to describe physiotherapists' conceptions of physiotherapy knowledge which has again illustrated the complexity and multi-dimensional nature of physiotherapy. The results from the 10 semi-structured interviews (from physiotherapists working in a number of areas including neurology) in this phenomenographic study describe four different categories for the generation of physiotherapy knowledge; 1. Interaction- "The conception of physiotherapy knowledge is described in terms of how different types of knowledge are used to collaborate and interact with patients" (p112) this

is influenced by both theoretical and practical knowledge; 2. Personal competencies- “Physiotherapy knowledge is conceived to be tacitly and individually related to research and experience”(p112) where knowledge development relies on the time, enthusiasm and person’s ability to comprehend; 3. Professional demands- “Physiotherapy knowledge is conceived as being related to the professional demands that education, healthcare units, society and the influence of different workplaces and cultural traditions place on the profession”(p112); 4. Scientific areas- “The conception of physiotherapy knowledge is described as a well-defined area of knowledge that can be separated into different scientific areas” (p112) for example anatomy or psychology.

Larsson & Gard (2006) have suggested that this knowledge could be valuable information in an educational setting. If this model is applied to the specific area of neurological physiotherapy, perhaps this could illuminate some of the challenges that the students are presented with. The ‘interaction’ with neurological patients is difficult due to a lack of opportunity and because of the specific neurological symptoms which might include communication problems, memory or awareness issues. An added complication is the heterogeneity of the client group because no two neurological patients will present in the same way. The ‘personal competencies’ of the individual students will vary, however many of them will have only limited experience of neurological patients to draw upon. The ‘professional demands’ from physiotherapy are clearly defined in standards of practice. There are also pressures exerted by the department of health (DOH). At present neurological patient management features highly on the national agenda with the publication of The National Service Framework (NSF) for long term conditions (DOH 2005). This NSF sets 11 quality requirements to transform the way health and social care services support people with long-term neurological conditions to

live as independently as possible. There is also the National Stroke Strategy (DOH 2007) which sets out to improve services for stroke patients and most recently the NICE (2013) clinical guidance for stroke rehabilitation. Finally the 'scientific areas' have previously been described as being well-defined. However the number of competing areas of knowledge required for a particular patient group must add to the complexity of the situation. In the example of neurology, in addition to the musculoskeletal anatomy, physiology and pathology the student also needs to understand the neurological anatomy, physiology, and pathology, as well as other holistic considerations. These four categories are later used as a template for discussions emerging from the research results pertinent to the conception of neurological physiotherapy knowledge.

The added complexity of the neurological physiotherapy treatment options was discussed in the section 1.3. Marsden & Greenwood (2005) highlight the research that is needed to define interventions but highlights that protocols are extremely difficult to devise due to the wide differences in stroke presentation and the constantly evolving dynamic approaches. This undoubtedly also provides similar challenges for the students trying to learn these interventions.

The challenge to learn a treatment approach which requires such an in-depth level of understanding and problem solving can be in part reasoned using the 'approaches to learning' theory in higher education. This task demands a great emphasis on 'deep approaches to learning' in order to grasp the underlying meaning (Marshall & Case 2004). It will not suffice to solely use 'surface approaches to learning' (Marshall & Case 2004) as memorising knowledge and interventions without appropriate depth of understanding will not allow the student to effectively problem solve the best course of action for the patient. Although it should be remembered that these approaches were first described in the context

of a reading task and may not address the complexity of the approach to learning neurological physiotherapy.

Lindquist et al (2010) is the first longitudinal exploration of students' experiences of learning to be a physiotherapist. This is inclusive of all areas of physiotherapy and not specific to neurology but the results of this metasynthesis of four qualitative studies can add a further insight into the potential difficulty physiotherapy students have learning neurology in their second year. Lindquist et al (2010) studied 18 physiotherapy students over the 3 year curriculum using semi-structured interviews conducted in each of the 6 terms. The underpinning method of analysis was phenomenography. The four studies titles and their data which was included in this metasynthesis are as follows;.Study 1: The expectations of learning were: "Behaving professionally, Instructing, Caring, and Communicating" (p105). Study 2: The early valued learning experiences were: "Support/feedback, others and self, Observation, Participation" (p105). Study 3: The pathways of learning identified were: "Searching evidence, Performing skills, Communicating, Reflecting" (p105). Study 4: The professional identities at graduation were: "Treater, Educator, Empowerer" (p105). The result of the metasynthesis was three emergent categories of different learning patterns being identified across the curriculum which were assigned the titles; Learning to cure, Learning to educate, and Learning to manage. It is a little unclear if the authors consider that these three categories could be linear stages and evidence of the students progression. It is stated that the learning patterns should not be regarded as mutually exclusive which would imply that they are not progressive stages and that they can run concurrently through the course. The authors have acknowledged that their findings place current learning theory in a physiotherapy education context in parallel with the movement continuum theory of physiotherapy practice. This

illustrates the application of different theory to areas of physiotherapy learning but might also lead you to think that the learning patterns could also be a continuum.

It might be argued that physiotherapy students are making the transition early in their second year from a ‘learning to cure body structure’ pattern of learning to a ‘learning to educate about movement problems’ pattern of learning (Lindquist et al 2010). Personal experience suggests that there is potentially considerable overlap between the identified patterns however, the years of study could crudely relate to the three learning patterns. The first year of the course concentrates on the assessment and treatment (“to cure”) of musculoskeletal “movement injuries” (p106) and in doing so treating “limitations in range of movement, strength, endurance and balance” (p106). The educator is seen as an expert that should be imitated and students “develop an attitude of defending physiotherapy knowledge” (p106). The second year, which is where the learning of neurology occurs, is concerned to an even greater extent than the first year with solving problems of movement through educating clients. “The knowledge base is seen to be developed by experiential practice generated through communication with clients and colleagues” (p106). The clinical placements do not begin until the end of the first year which links to this distinction. The presenting problems of a neurological case are complex (as identified previously) so the movement problem solving skills need to be well developed to be equipped to deal with this. The third year is concerned with learning the wider context of physiotherapy. It is “focused on how to support peoples’ independence to help them to find new ways to move in activities in their chosen context and to help them adjust their environments” Lindquist et al (2010:107).

On reviewing the three patterns of learning it appears that there are echoes of The ICF - International Classification of Functioning, Disability and Health (WHO

2010:1), which classifies health and health-related domains. “These domains are classified from body, individual and societal perspectives by means of two lists: a list of body functions and structure, and a list of domains of activity and participation. Since an individual’s functioning and disability occurs in a context, the ICF also includes a list of environmental factors”. In essence ‘learning to cure body structure’ relates to the impairment of body functions and structure domain of the ICF, ‘learning to educate about movement problems’ relates to the ‘activity’ domain, and ‘learning to manage peoples’ health relates to the ‘participation’ domain. The lack of recognition of this by Lindquist et al (2010) may have been incidental, or an avenue that they did not wish to explore, in any case this warrants further thought particularly in the educational context where the ICF has received increasing emphasis.

The ICF is frequently used in teaching as a guiding framework during assessment and treatment but it is used in its interconnecting format, not as linear or sequential stages. This may also be the intention of the three patterns of learning that they are running in parallel throughout the course however there may just be a bias towards one pattern dependent on the individual and the context and stage of the course.

2.2.4 THEORIES OF LEARNING UNDERPINNING THE TEACHING OF NEUROLOGICAL PHYSIOTHERAPY

Learning approach

The students on the BSc and MSc programmes are adult learners with varying previous learning experiences. The majority of students on the BSc programme have come straight from school doing ‘A’ levels and the students on the MSc programme have come from studying a previous degree. These previous

experiences of learning will influence the students approach to learning in the early stages of the physiotherapy programmes. The influence of previous learning experiences can present students with a predisposition to either a surface learning approach or a deep learning approach (Ramsden 2003). The students' intentions when undertaking tasks will differ for each of the approaches to learning. The intention using the deep approach is to understand whereas the intention using the surface approach is only to complete the task requirements and this may be achieved in a distorted way (Ramsden 2003). The assumption is made that the MSc students will have engaged in tasks requiring a deep approach during their previous degree studies and will utilise these skills from the outset. Whereas the BSc students may have experienced tasks demanding surface and deep approaches and will therefore need more introductions to tasks using the deep learning approach.

The learning of neurological physiotherapy requires a deep approach to ensure the students have the understanding of the knowledge, skills and behaviour in order to be able to adapt this and make informed decisions about patient care. This depth of understanding is essential to achieve the clinical reasoning as described earlier. The teaching methods in both programmes reflect this ethos by employing strategies to encourage the deep approach to learning. In the MSc programme the EBL approach is a good example of this. In the BSc programme the use of case based teaching material and student led seminars are examples of this.

One of the challenges recognised here is that there is a close association between the approach taken and the student's motivation. The deep approach is often favoured by an individual where there is an intrinsic motivation whereas the surface approach is employed where the motivation is extrinsic (Atherton 2013).

The physiotherapy students on the programmes will have intrinsic motivation to become physiotherapists and will therefore employ a deep approach to their learning of those aspects that they see as relevant for becoming a physiotherapist. However it would be unrealistic to assume that every student will have a keen interested in all the core areas of physiotherapy. This means that potentially the areas they are least interested in, which might be neurology, will produce more surface learning strategies, with the intention of fulfilling the extrinsic requirements to pass the assignments and placement experience.

Theories of learning

The basic theories of learning can be categorised under the umbrellas of; behaviorist; cognitive; humanist; and social. However it is also acknowledged that there is considerable overlap between them, particularly the humanist and social theories (Jarvis 2004). Atherton (2013) uses slightly different terminology and suggests the key branches of theories of learning are behavioural; cognitive; humanistic; and motivation.

These are the theories that underpin the pedagogical approach taken during teaching. There are a great number of models and frameworks which describe learning styles or strategies which identify student's individual strengths and weaknesses, which can inform how the teaching is structured to play to the strengths of individual learners. Individual learning styles have developed from the study of informal learning and the debate regarding learning styles continues to rage (Rogers 2013). Rogers (2013) highlights how Jungian psychologists perceive the visual (and sometimes reading), aural, and kinaesthetic learning styles as innate. As opposed to the social learning school, who present concrete experience; reflective observation; abstract conceptualisation; and active experimentation as preferred learning styles which combine into convergers;

divergers; assimilators; and accommodators and develop through years of use. However these theories have come under great criticism particularly when they attempt to inform pedagogy because these learning styles are generally developed informally rather than formally. Although learning style instruments can be easily administered online, there is limited evidence for their reliability and validity (Coffield et al 2004). In a systematic review of learning styles and pedagogy in post-16 learning 71 models were identified and the 13 major models were included in the review. The key conclusion from this review was that “we are still some way from an overarching and agreed theory of pedagogy” (Coffield 2004:144). Entwistle’s concept of deep, surface and strategic approaches to learning as discussed above was accepted on the grounds of robustness and ecological validity (Coffield 2004).

Formal, non-formal and informal learning.

This research is based on students’ experiences of the formal learning of neurological physiotherapy achieved within university. The writing of this review has heightened my awareness and consideration of the potential influences of the non-formal and informal learning that pre-cede and accompany the formal learning Rogers (2013). There is ongoing debate about the definitions of non-formal and informal learning and the characteristics of both. Malcolm et al (2003) suggested that all examples of formal, non-formal and informal learning had attributes of formality and informality.

Students’ perceptions of neurology and their interest and motivation for the area are influenced by the unconscious informal learning that has occurred. This is present in the student’s values, assumptions and expectations and will dictate the motivation for non-formal and formal learning (Rogers 2013). It is the informal learning that is the largest part of the learning that occurs and it is this which builds

or destroys confidence during new learning (Rogers 2013). The opportunity for non-formal and informal learning related to the management of neurological patients is limited within the university setting. The learning is predominantly encouraged through formal strategies. In stark comparison to the practice placement environment where the opportunities for such learning are plentiful and this might explain why students enjoy placement experiences and seem to learn so much in such a short space of time.

Experiential learning.

Experiential learning theory is central to vocational education such as the BSc and MSc Physiotherapy programmes because the adult learners on the course will be required to successfully complete the practice placement components to demonstrate their competence. Students' experiences during clinical placement can be defined as primary experiential learning as they learn through sensory experience as well as their minds, so they learn to experience an actual situation and to learn from it (Jarvis 2004). Within the university based teaching that prepares students for practice placement a secondary or mediated experiential learning occurs, the learning occurs through the communication of meaning (Jarvis 2004). In this case as lecturers we present hypothetical scenarios of patients which the student's attempt to problem solve. Kolb's theory of experiential learning cycle has been the most influential (Jarvis 2004) and provides a vehicle to discuss how the primary and secondary experiences are linked. Within a primary experience, such as on practice placement, the student will have a 'concrete experience' which will involve 'observations and reflections' from which the 'formulisation of abstract concepts and generalisation' will occur followed by the 'testing implications of concepts on new situations' before the cycle starts again (Jarvis 2004). The secondary experience offered in university in preparation for

practice placement could join the cycle in a different place, at the ‘observations and reflections’ stage.

The key issue to remember is that this experiential learning is occurring all of the time and not just within the formally constructed teaching opportunities. This makes this learning even more complex process to guide.

This summary has focused on the university based learning of neurological physiotherapy as this is the context for the research. This research focuses on the role of the university teaching in preparing the students for clinical practice placements. Although it is important to note that there is research into the learning that takes place in physiotherapy clinical practice. It is evident that the practice placement is a powerful experience in determining if a student chooses to specialise in the given area. As McKenna et al (2001) identified, clinical fieldwork and clinicians have the greatest influence on students career decisions. The student’s clinical experience will in turn be more positive if the student is effectively prepared for the experience by the university teaching and learning.
This review provides the background to proceed with exploring the research questions, which are re-cited below, and provides the context in which to discuss the findings from the research.

- What are students’ perceptions of the area of neurology?
    - Do students experience symptoms of neurophobia in a similar way to medical students?
- What are the students’ experiences of the university based learning of neurological physiotherapy?
    - What are students’ experiences of learning clinical reasoning in neurological physiotherapy?

Ethical approval to conduct this research was obtained from the relevant school committee at the participating HEI. A copy of the approval letter is included as appendix 2.

In the following, Chapter 3 describes how the research methodology was shaped and the methods employed for data collection and analysis to answer the research questions.

3.0 METHODOLOGY

In this methodology chapter I discuss and justify the mixed methods case study approach adopted for this study, with a consideration of the ontological and epistemological principles underpinning the study (3.1). This is followed by a description of the data collection (3.3) and data analysis (3.4) methods, with an account of my consideration for ethical issues (3.5) and for ensuring the rigour of the research (3.6).

3.1 ONTOLOGICAL AND EPISTEMOLOGICAL PRINCIPLES

Two of the first most important questions to ask as a researcher when deciding what your research is about are: what are your ontological and epistemological positions? (Mason 2006). Ontology refers to your theory of what exists and how it exists, whereas epistemology refers to your theory of how we come to know these things (Clough and Nutbrown 2007).

The most important feature of this research was to gain access to the experiences of the physiotherapy students and their attitudes towards the topic of neurology and the teaching they experience. I believe that these aspects can be observed and understood through discussion. This represents a position at the constructivism end of the epistemological spectrum (Grbich 1999).

The recognition of the ontological and epistemological principles of the study is congruent with the fundamental assumptions of the chosen case study approach and the choice of data collection methods.

3.1.1 REFLECTIONS ON DETERMINING THE METHODOLOGICAL APPROACH

The definition of my chosen methodological approach has been an anxiety I have contained throughout the whole research process. I have been fully aware of my qualitative rather than quantitative approach but have struggled to understand the distinctions between the qualitative methodological approaches and philosophies. I therefore approached the research design in a quite pragmatic way and focused more on the most appropriate and practical methods to answer the research questions. I did spend some time considering my own assumptions before embarking on the research, as evidenced above, which I knew should help define the underpinning philosophy of the research, although my efforts were quickly focused in conducting the data collection. Had I have taken the time to consider this more thoroughly, I believe the research would have been better grounded within the principles of the chosen approach deliberately rather than intuitively. It is important to be transparent about the underpinning philosophy of the research and not to simply use 'qualitative' as an all-encompassing term as the presentation of the methodology would become simply a description of qualitative methods, which has been a criticism of much early research pre 1990 (Appleton & King 1997). Guba and Lincoln (1994:116) purport "no inquirer, we maintain, ought to go about the business of inquiry without being clear about just what paradigm informs and guides his or her approach". I was clear about my own ontological and epistemological stance but had not linked this to the relevant research paradigm early enough to explicitly inform and guide research decisions.

Initially my research design was to be guided by ethnography, although I acknowledged that my research did not fit with all its guiding principles (Hammersley & Atkinson 2007). Participant observation which is most often the primary method of ethnographers (O'Reilly 2009) was not to be the primary

method in this research due to the constraints of researcher time, timetabling of teaching sessions to be observed and the role of the researcher as a lecturer of the topic being explored. There was also an intention from the outset to use interviews as the primary method which is not typical of the ethnography approach to research design. The prolonged observation of participants through ethnographic studies and the open ended approach was also impossible to achieve due to the restraints of the Doctoral structure and being in full time employment. It is also difficult to apply pure ethnography in this study because of my experiences and preconceived ideas that physiotherapy students find neurology difficult. I had questions in my mind to enquire as to why this may be the case. This does not reflect a purely iterative-inductive research approach as seen in ethnography (O'Reilly 2009). Although I do acknowledge that the reasons for the fear of neurology might be defined inductively. I also acknowledge that there are aspects of being an 'insider' (O'Reilly 2009) in the research that I can learn from the ethnography approach. As an alternative I considered phenomenology and latterly phenomenography, due to the number of related studies employing the same approach. I provide examples of these here.

Shanahan (2000) studied the mature students' experience of university and healthcare education using a phenomenological approach. A triangulation of data collection methods was used for the 5 volunteers including a face-to-face café interview, a diary, and a questionnaire and group discussion. Interestingly the author of the study was a member of the teaching team for many of these students, as I will be in my study, and to minimise the influences this relationship might have on the respondents the choice of data collection method was selected depending on the familiarity of the relationship. The least well known respondent

was given the interview and the most familiar was given the diary, the others were given the questionnaire and group discussion (Shanahan 2000).

In my view this study has not demonstrated sufficient reflexivity about how her role may have influenced the volunteers behaviour and results gained. The level of reflexivity for some researchers does not appear to be a significant requirement of this philosophical approach, and bracketing is preferred. The concept of bracketing was established in the early work of the founder Husserl as part of the phenomenology movement but was later challenged by one of his students Heidegger who felt he had been mistaken in this and actually an attempt at bracketing would paradoxically prevent a genuine experience of the phenomena (Lewis & Staehler 2010). The notion of 'bracketing' described as the "process of identifying and holding in abeyance preconceived beliefs and opinions about the phenomenon under study" (Polit & Beck 2013:270) as in Husserl phenomenology, was an aspect of the research I did not want to conform to. In this research the influence of my role as the lecturer and the researcher does impact on the students experience and participation in the research. So I need to acknowledge the reflexive elements about how this may be the case.

This phenomenological study did demonstrate that interviewing is not the only method utilised in this approach, and that a triangulation of data collection methods can be beneficial. All of the chosen methods do involve asking the volunteer to participate in something out of the ordinary and being asked to consider and report on certain issues. The results of these might logically therefore be different to observing the volunteers behaviour in their natural environment, which is one method I attempted within my research.

The students in the Shanahan (2000) phenomenological study were carefully chosen because of exposure to the phenomenon being studied (Creswell 1998).

All of the students on the physiotherapy programme were eligible to participate in my research and therefore the sampling method was more convenience than purposive.

Lindquist et al (2006) used a phenomenographic approach to the study of physiotherapy students' experiences of professional socialisation which involved 75 interviews carried out with 21 students from 2 sites over their 3 year degree education period. Students were purposively sampled providing a variation of gender, age, educational background, academic abilities and work experiences. The interview guide used for the semi-structured interviews is clearly documented. The results of the study discuss four development pathways of learning; 'reflecting on practice', 'communicating with others', performing skills', and 'searching evidence', each supported with direct quotes. It is unclear however how these were determined as the data analysis coding is not stated. It states that descriptions of categories were agreed by consensus in the research group, however transparency of some of these discussions and conflicts would have added to the paper.

My assumption that phenomenographic studies were phenomenological was not correct although there is some debate surrounding this assumption. There are many similarities between the approaches but there are also some clear distinctions (Hasselgren & Beach 1997). The approach does sound particularly relevant to studying higher education students because one of its outcomes is "clarifying functional relationships between what people do when they engage in learning activities and the nature of understanding they end up with" (Entwhistle 1997:128). The distinctions between the two seems to be that phenomenography "goes beyond the description of categories to the detection of underlying meaning", which involves analysing the meaning of all categories as they interact

with each other and an analysis of the meanings of individual differences (Entwhistle 1997:127). This can be viewed as different to the search for a 'single unifying meaning' (Creswell 1998) often described in phenomenological studies. Larsson & Gard (2006) clearly describe the distinction between Phenomenology as a first order perspective, describing the phenomenon as an aggregated mental construction, and Phenomenography as second order defining the differences in how they conceptualise the phenomenon. The phenomenographic data analysis procedure has 7 clearly defined steps to ensure this is achieved. These are termed; Familiarisation; condensation; comparison; grouping; articulation; labelling; contrasting (Larsson & Gard 2006).

Entwhistle (1997:127) highlights that most phenomenographic studies derive their data from interviews, which suggests that the greatest emphasis is placed on the spoken language interpretation of events. In my research the importance of observing classroom interaction, is seen as integral to understanding how the students feel about the subject, even though interviews were the main data collection method.

An additional critique of phenomenographers by Hasselgren & Beach (1997:193) is that little attention is paid to reflexivity, with most phenomenographers simply accepting "findings as genuinely denoting a map over the field of existing person-world relationships in relation to a particular phenomenon". Reflexivity is an aspect of my research that will be important due to the nature of my role as the researcher and the lecturer teaching neurological physiotherapy.

3.1.2 USING A CASE STUDY APPROACH

This journey of indecision through the methodological approaches highlighted a number of key characteristics of my research which needed to be reflected in the

approach adopted. The approach which was most congruent with these characteristics was a mixed methods case study approach because it “facilitates exploration of a phenomenon within its context using a variety of data sources” (Baxter & Jack 2008:544). This approach is based in a constructivist paradigm and it enables a close collaboration between the researcher and the participants to facilitate a better understanding of their views of reality (Baxter & Jack 2008:545).

The scope of a case study allows the in depth exploration of a phenomenon within its real life context (Yin 2009). In this research the experience of learning neurological physiotherapy is studied within the pre-registration physiotherapy programmes. Utilising the case study approach allows the research to explore the how and why questions linked to students views of their experiences of the university teaching. It is also impossible to separate the phenomenon and the context and the boundaries between them are unclear adding further justification for the approach (Baxter & Jack 2008). It is unclear how much influence the structure of the programmes and the teaching have on the potential neurophobia experienced by students. Ridsdale alludes to this in relation to medical students when he suggests that neurophobia “is likely to develop at medical school, and even be caused by it” (Ridsdale et al 2007:119).

The case is defined for this research as the student experiences of learning of neurological physiotherapy within the courses taught in the participating HEI. The binding of the case ensures the research is reasonable in its scope (Baxter & Jack 2008). There are a number of ways in which the binding of the case occurred. The research focuses on the university based teaching and learning rather than the clinical placement environment within the 2 pre-registration physiotherapy programs at this UK institution, across a 6 month time period. It includes students’

from all years of study and would therefore include those prior to the neurological specific teaching, during the teaching and post the neurological teaching block.

3.2 PROCEDURE AND CONTEXT

The sequencing and timing of events is presented below.

<table>
<tr><td>Timeline</td><td colspan="3">Research Procedure</td></tr>
<tr><td>July 2012</td><td rowspan="3">Questionnaires sent to all 110 current PT students (40 MSc and 70 BSc)</td><td colspan="2" rowspan="3">Research Advertised in the school</td></tr>
<tr><td>August 2012</td></tr>
<tr><td>September 2012</td></tr>
<tr><td>October 2012</td><td colspan="3">Volunteers requested for interviews via email to all PT students, on the questionnaire replies, and posters on student notice boards</td></tr>
<tr><td>November 2012</td><td>Data analysis of the 25 questionnaire responses</td><td></td><td rowspan="2">Observations notes made during my neurological teaching sessions AND observation of 4 other neurology sessions (neuro anatomy, physiology, human sciences, and professional practice sessions).</td></tr>
<tr><td>December 2012</td><td></td><td rowspan="2">15 Interviews; BSc students; 1 from year 1, 2 from year 2, 2 from year 3 (5). MSc students; 5 from year 1 and 5 from year 2 (10).</td></tr>
<tr><td>January 2013</td><td></td><td>Data analysis of observation findings</td></tr>
<tr><td>February 2013</td><td></td><td rowspan="3">Data analysis of interview results</td><td></td></tr>
<tr><td>March2013</td><td></td><td></td></tr>
<tr><td>April 2013</td><td></td><td></td></tr>
<tr><td>May 2013</td><td colspan="3" rowspan="3">Merged data analysis of questionnaire, interview and observation findings</td></tr>
<tr><td>June 2013</td></tr>
<tr><td>July 2013</td></tr>
<tr><td>August 2013</td><td colspan="3" rowspan="2">Discussion of findings in light of previous literature towards answering the research questions</td></tr>
<tr><td>September 2013</td></tr>
<tr><td>October – December 2013</td><td colspan="3">Final write up of thesis</td></tr>
</table>

Figure 3 Sequencing of events.

This research was conducted in one UK HEI, which is one of 35 universities in the UK that offers Physiotherapy courses. The methods employed in this research were questionnaires, interviews and observations. The justification for these data collection methods will be discussed in more detail in the following section.

3.3 METHODS OF DATA COLLECTION

I adopted a pragmatic use of mixed methods in this research and will give the justification for these choices. As the researcher I was the main research instrument and performed the data collection and all of the analysis.

3.3.1 QUESTIONNAIRES

The survey questionnaire (Appendix 5) was emailed to all pre-registration physiotherapy students between July 2012 and September 2012. The questionnaire was accompanied by the participant information letter (Appendix 3) with an invitation for them to consider volunteering for a subsequent interview. The students were asked to complete the attached questionnaire and return either via email or by leaving a printed copy in my pigeon hole in reception. An additional email reminder was sent at the end of September.

A questionnaire used in previous studies into neurophobia for medical students (Schon et al 2002 and Flanagan et al 2007) was adapted to suit Physiotherapy students in this research (Appendix 5). A copy of the questionnaire used by Flanagan et al (2007) has been provided in Appendix 6 so that it is clear to see how the questionnaire was adapted to suit the physiotherapy student population and to encourage more qualitative justification of responses. One important change required was a reduction in the range of subjects taught. The medical questionnaire (Appendix 6) included eight areas of practice whereas my

physiotherapy questionnaire included just three core areas of practice. Questions 2,4,5,7 and 8 in the Flanagan et al (2007) questionnaire were adapted in this way and used within this research questionnaire. Question 2 and 6 in the Flanagan et al (2007) questionnaire were not included because with only three areas of practice it would be clear to see in the responses to the other questions the comparison of levels of interest and difficulty. There were also some minor changes to the phrasing of questions to aid comprehension and requests to add additional comments if they wished after each question. Question 5 in the research questionnaire was very similar to question 8 in the Flanagan et al (2007) questionnaire, although the options provided were also informed by the literature review. Question 6 in the research questionnaire was left open for students to suggest what could help overcome any difficulties, which is quite different to question 9 in the Flanagan et al (2007) questionnaire where the focus is which teaching strategies were perceived to improve competency. The questionnaire sent out to all 110 pre-registration physiotherapy students (70 BSc students and 40 MSc students) studying at the participating HEI.

It had not been my intention to use a survey questionnaire when my initial interest in exploring student physiotherapists' experiences of learning neurology began. However, once I had reviewed the available literature, it became apparent that in order to place my case study research in the field of previous research this method would provide valuable links, as it had been the preferred data collection method in the majority of the medical studies looking into neurophobia. This pragmatic decision to use questionnaires as a means to place the case study results in the context of the neurophobia literature resulted in the mixed methods approach. Denzin (1989) would describe the approach adopted in this research as 'between method triangulation' as it involves the use of two distinct methodological

approaches for data collection. In this research, a quantitative descriptive questionnaire was utilised to generate a profile of the presence of neurophobia across the group of neurological physiotherapy students. The questionnaire did have some more qualitative open questions built in too. The qualitative follow up interviews gathered in-depth individual student's experiences and ideas about learning neurological physiotherapy. It is considered that the data collected was complimentary, particularly as the interview discussions were in part directed by the questionnaire results. Each of the methods looked at different aspects in answering the research questions to make use of strengths of this method. This has been identified as one beneficial use of combining different methodological methods (Sim & Wright 2000).

As confirmed above, a mixed method or triangulation approach in this study has been chosen in order to answer the nature and scope of the particular research aims. To quote Depoy & Giltin's (cited in Sim & Sharp 1998 p27) clarification, the triangulation in this research is not 'triangulation for confirmation' but 'confirmation for completeness', in order to answer the research aims fully and discuss in light of previous research. Richie & Lewis (2003) also identify that it is appropriate to utilise qualitative methods following a survey in order to seek a greater understanding of the factors underlying a problem, in this case neurophobia.

The questionnaire design used closed questions accompanied by open questions; this was to ensure a speedy completion of fixed replies when seeking appropriate factual and attitudinal information but also allowed the respondents the freedom to express their ideas, outside of the constraints of pre-set answers (Oppenheim 1992). Had I have chosen to develop a new questionnaire, rather than adapting an established questionnaire, I would have changed the questions into statements and used a likert scale to measure the levels of agreement and attitude (Sim &

Wright 2000). The use of likert type scales is a common method in measuring attitude, although not relevant for this research, the controversy regarding whether these yield ordinal or interval data is noted (Jamieson 2004).

The questionnaire adopted 4 questions using a 5 level response to the question linked to different categories, similar to a likert scale although they were not levels of agreement. The 5th question had 3 level response options, each of which was followed by an open response opportunity to qualify or expand on the fixed responses. See appendix 5 for a copy of the questionnaire.

The questionnaire was administered via email and responses were sent via email or posted into my work pigeon hole on site. An email reminder was sent out, which is an example of good practice in an attempt to increase the response rate (Oppenhiem1992).

The results of the questionnaires were analysed using descriptive statistics, the results of which can be found in Chapter 4. The results were ultimately analysed in conjunction with the findings from the interviews and observations in order to answer the research questions.

3.3.2 OBSERVATIONS

Consistent with my epistemological assumptions, I felt strongly that observation needed to complement the data collection methods employed in this research, even if it was not practical to be the sole data collection method. There are four types of participant observation identified by Walsh (1998): complete participant, complete observer, participant as observer, and observer as participant. My lecturer role necessitated that I adopt the position of ‘participant as observer’ when leading a teaching session whilst also observing student interactions, but adopt a ‘complete observer’ role when present to observe as a researcher only.

The coordination and planning of observation opportunities was difficult due to timetabling and teaching commitments. My intention was to observe a range of neurology related subjects. It was feasible to plan in advance for three sessions to be observed and a final session became a possibility to observe at very short notice. The purpose of the observation was discussed with the relevant lecturer prior to the teaching session and agreement to observe the session obtained verbally. In addition to observing others teaching session, I also attempted to conduct some observations during my own teaching sessions. It was not possible to plan these in advance. Observations were recorded as handwritten notes when an event provoked me to reflect on its relevance to the research.

Students were reminded at the beginning of the teaching session that I was observing and students were asked to state if they were not happy with this. None of the students reported having any problems with me acting as an observer. This might be apportioned to the fact that they were so used to me being involved in the teaching anyway. It was possible for me to observe 4 sessions delivered by other lecturers which included a neuroanatomy session, a neurophysiology session, applied psychology and a practical skills session.

I also made notes on observations during my own teaching. I am involved in the majority of the neurological physiotherapy teaching for the BSc and MSc students and deliver much of this. The notes I have made refer to a number of different sessions including practical skills sessions, lectures, and patient treatment sessions. I attempted to make any notes during or immediately after the observation and prior to discussing any observations in an attempt to avoid ‘reinterpretation’ or ‘reconstruction’ of the observed events (Grbich 1999:134). The notes should have provided thick description of the experiences observed (Becker 2009) although this was not always the case due to time constraints. Often my

notes were brief statements about students' behaviour or expression of their attitude, or comments they had made. A summary of these can be found in Chapter 4 where these observations are discussed along with the findings from the questionnaires and interviews.

In addition to the questionnaires and the observation, interviews were also used to explore issues in more detail.

3.3.3 INTERVIEWS

All 16 of the physiotherapy students that indicated via email or on the questionnaire they would be happy to be part of the interviews, were contacted via email to arrange a convenient time and location to conduct the interviews. There was only one student that was unavailable during the research time period and was therefore unable to be interviewed.

The interviews in this research have complemented the observations because the interviews provide access to what people say whereas the observations access to what they do (Green & Thorogood 2004).

At the start of the interview the written consent provided by the student was checked to confirm the student was still willing to participate (Appendix 4). It was also checked that the participant information sheet (Appendix 3) had been read and understood, so that any questions could be answered. The interviews followed a semi-structured approach with a general guide of topics and questions (Appendix 7) but also allowed the freedom for the participant to explore other areas as relevant to their experiences and the research objectives.

The intention had been to interview 5 students from each year on each course but there were not enough volunteers to meet this intention. A total of 15 in-depth

interviews were conducted across a 3 month period with each interview lasting between 45-60 minutes. Each interview was digitally recorded with the signed agreement of the participant in order to allow analysis. The interviews took place in either a university office or teaching space, after the time and location had been agreed with the participant. There was also tea, coffee and biscuits available at all interviews to help to create an informal and relaxed atmosphere.

Following the interviews eight of the participants were given a copy of the transcription to which they could add any comments, this member checking was an attempt to improve the face validity of the results and therefore improve the rigour of the research (Grbich 1999). Unfortunately it was not possible to get all transcripts member checked because the delay between interviewing and transcribing resulted in many final year students leaving the university without providing me with a forwarding address. I also made a pragmatic decision to analyse the final audio tapes via NVivo rather than doing full transcriptions and therefore these transcripts were not available to be member checked.

I conducted analysis of the data with the assistance of NVivo software. This will be described in the following section (3.4).

There is some debate in the literature about whether methods that traditionally fit within different methodologies can be compatible. However as Hesse-Biber (2010:456) states “the deployment of a qualitative methodology does not rule out the use of quantitative methods”. The design to be used in this pragmatic research is quantitative followed by qualitative methods referred to as QUAN + QUAL which is the most common (Hesse-Biber 2010). In my research this ordering of data collection method are not being performed as a way to validate the statistical findings of the quantitative aspects. The study is structured in this way because of the questionnaires can be administered whilst recruiting for the interviews. The

questionnaire being administered is also being used in a very similar format to that used in the background medical literature to allow for a comparative discussion, in the absence of any physiotherapy specific literature or other qualitative studies.

3.4 DATA ANALYSIS

A description of the data analysis process is provided here and the evidence of the application of this is provided in Chapters 4 and 5 where the results of the data analysis are presented and discussed.

The results from the questionnaires (section 4.1), observations (section 4.2) and the interviews (section 4.3) were analysed separately due to the practicalities of the timings of data collection and then synthesised in order to provide the emerged findings from the collective case study (section 4.4). The quantitative questionnaire results were analysed using descriptive statistics with the assistance of Microsoft office excel. Descriptive statistics are numbers that characterise features of the data which are presented in tables or graphs (Martin & Larson 2006).The basic numerical representations of the responses to the questionnaire allow comparison to previous medical literature.

The notes recorded from the observations are provided as a brief written summary for each session observed allowing for later elaboration in the text. This has been represented in Table 10. My own observations during my teaching sessions are described and analysed in section 4.2. The key issues and themes from the 4 selected observations are described. These observations are used critically in discussion with the questionnaire and interview findings to define the final research emergent themes.

The interviews were analysed using inductive thematic analysis which involves coding, categorising and making sense of the essential meanings of the

phenomenon. The rich descriptive data is reviewed until themes or essences begin to emerge (Kleiman 2004). All of the audio recordings were listened to within a few days after the interview taking place to familiarise myself with the content in preparation for subsequent interviews. On completion of the data collection phase many of the audio recordings were transcribed verbatim. I also decided to use NVivo during the data analysis.

NVivo is a computer programme that assists data analysis by providing a set of tools, with the purpose of supporting the data analysis rather than replacing it (Bazeley 2008). One of the functions of NVivo is the option to code directly from the audio recording, which I chose to do for the last 5 interviews as a time saving exercise. The transcripts were read several times then sections of the text and their interpretation were identified as codes, the same was performed with the audio recordings, as text was clipped and assigned a code, both within NVivo. As these codes started to increase in number they naturally emerged as belonging to particular categories. Those codes that did not match a category or were interesting but not directly relevant to the research were kept in a separate folder. Subsequently some of these categories were related and therefore referred to as themes (Sim & Wright 2000). A diagrammatic structure of the coding process is provided on page 130.

Once the questionnaires, observations and interviews had been analysed, the results were synthesised and re-analysed to identify the final emergent themes (section 4.4), to answer the research questions and for further discussion in relation to the background literature (section 5).

3.5 ETHICS

This study followed the research ethical guidelines of the participating HEI. The generic rule of ethical considerations is to 'do no harm' (Ellis 2007). All researchers do have a responsibility to protect their subjects from harm and have regard for their rights. Murphy & Dingwall (2007) highlight that ethical considerations can be discussed in relation to firstly the outcome of the research and whether participants were harmed in any way and if so can that harm be outweighed by the research benefits. This is the domain of consequentialist approaches to research ethics. Secondly, are ethical considerations in relation to the inherent rights of participants, which include privacy, respect and self-determination, this is known as the deontological approach to research ethics.

This section provides the evidence that I have given appropriate attention to the ethical considerations highlighted above, throughout this research. This research involves human participants; students from the BSc and MSc physiotherapy programmes. The research is non-invasive in nature because it utilises questionnaires, interviews and observation as data collection methods.

The appropriate ethical approval was gained from the School of Education and Lifelong learning ethics committee prior to commencing the research.

3.5.1 SAFETY AND WELLBEING

It was very unlikely that participants' involved in the research would be "exposed to risks that are greater than or additional to those they encounter in their normal lifestyles" (UEA 2011:4). The student volunteers were enrolled in a programme that encourages an ethos of self-evaluation, reflection and critical thinking and were therefore familiar with the questioning involved in surveys and interviews. Nonetheless it was essential that ethical approval and informed consent were

obtained prior to the commencement of the research. It was not envisaged that any questions used within the questionnaires or interviews would be “sensitive and likely to cause harm” (UEA 2011:4) however I felt it was necessary to trial some of the questions on a colleague prior to commencing the research. This confirmed to me that the content was very unlikely to cause harm.

My relationship with the student interviewee as the lecturer delivering the neurology teaching may have the potential to influence the interviewee’s responses. There was the potential that the students may not want to say anything to offend the lecturer or conversely they may want to take the opportunity to provide negative feedback about the teaching. This issue was addressed by discussing this very openly in the consent process, trying to alleviate any concerns of the interviewee, and encourage them to be as open and honest as possible. I did not get the sense that the students were cautious about their responses because of who I was. The only time a student appeared slightly uncomfortable in her response was when she was suggesting that one of the lecturers had not been as good at facilitating the practical sessions, and although she had not used the person’s name, she knew that I would know who she was referring to. In this situation I just reassured her that she could be open and honest and it would be dealt with confidentially.

As part of one student’s MSc research dissertation, she interviewed 5 of her colleagues with me present. This did mean that the students felt at ease with their colleague leading the interview, despite my presence, and adding some further questions at the end. The student interviewer was confident in the semi-structured interview approach and the purpose of the research with my support. The student’s involvement also resulted in the intended 5 students from that year being successfully recruited.

The relationship of the researcher as lecturer is constantly considered within the data analysis process to ensure the required level of reflexivity is achieved in order that any influences are transparent (Green & Thorogood 2004).

3.5.2 CONSENT

Informed consent was obtained in writing prior to participation. In recognising the potential influence of the researcher being the lecturer of the students to be studied and in order to avoid coercion, students were asked to volunteer freely. It was very clear that students did not need to participate and that they could withdraw from the research at any time without explanation. The participant information sheet (Appendix 3) and the consent form (Appendix 4) was constructed to ensure this information was explicit. It was also rechecked just before the start of the interview. The whole cohorts of students were made aware that this research was taking place and what its aims were because during some of the normal teaching sessions where the researcher is the lecturer there may be notes logged and observations made about the students comments and behaviours and additional sessions will be observed. In addition to this, when I was observing sessions presented by other faculty, the class was informed that I was there to observe and the students were asked if anyone objected. The students are familiar with this process as it is very similar to the staff peer review process. It was made explicit that in any instances where notes are made, the relevant students will not be identifiable. This should ensure the privacy and psychological wellbeing of the participants.

3.5.3 ANONYMITY AND CONFIDENTIALITY

All data collected was stored on a password protected USB stick and hardcopies in a locked filing cabinet in the researcher's office, of which only the researcher

has the key. The participants were all given a code rather than their name and this coding system will be kept separate to the data collected to ensure confidentiality because all the participants have the “right to privacy” (UEA 2011:6). In any subsequent write up of the data I will ensure that students cannot be identified by the information presented. It has been illustrated in previous published work that a period of greatest risk of causing offence to participants is at the time of publication, particularly if you had built a friendship with the participants (Ellis 2007).

3.5.4 ACCESS TO PARTICIPANTS

The participants in this research are physiotherapy students registered on the BSc and MSc physiotherapy programmes at the participating HEI. In total there are 3 years of BSc students with approx 20-25 per year and 2 years of MSc students with 20 per year which make up the study population (110 in total). All students were emailed with details of the research to be taking place and asked if they would like to volunteer to participate. There were also posters put up on the student notice boards in the building.

Access was not a problem because the students are already being taught by me and are easily accessible and potentially more amenable to the suggested research. The university is an environment that encourages research activity and the students are also continually asked to give feedback on their experiences of aspects of the course as part of the unit monitoring system. Before access was granted the usual stringent ethical approval process was completed. The issues related to accessing these students’ experiences might be less about the physical access to them and more about them accepting me as a researcher in light of me being their lecturer and volunteering themselves for the research. It was clear that

there were some years, year 1 BSc students for example, who were more reluctant to volunteer than others.

3.6 RELIABILITY AND VAILIDITY – ENSURING TRUSTWORTHINESS AND RIGOUR

Reliability and Validity are essential criterion for quality in quantitative paradigms, in qualitative paradigms the terms Credibility, Confirmability, Dependability and Transferability are the essential criteria for quality (Lincoln & Guba, 1985). Quality, rigor and trustworthiness often replace the terms reliability and validity in qualitative studies (Robson 2002). Trochim (2006) summarises the qualitative alternative terminology to those used in quantitative research. He highlights that 'credibility' is the equivalent to 'internal validity' and refers to the research demonstrating understanding from the participant's standpoint. 'Transferability' equates to 'external validity' and the researcher must ensure that a thorough job of describing the context and assumptions is achieved so that other researchers can make their judgements about transferring the results. The qualitative equivalent to reliability is 'dependability', although the researcher is not ensuring repeatability, a high level of detail of the changing context and effects on the research should be described. Finally 'confirmability' is the qualitative reflection of 'objectivity', representing the processes used to confirm the results e.g. member checking and audit trails.

Notwithstanding the terminology used the purpose of this section of the thesis is to provide justification for the measures taken to attempt to increase the credibility, transferability, dependability and confirmability and therefore the, trustworthiness and rigor of the research.

In order to achieve some confirmability I have been transparent by providing a clear account of the data analysis providing an audit trail that can be followed. Member checking (Robson 2002) has also been a method employed where possible. I have also ensured there is enough detail in the write up of the results to demonstrate the researcher's interpretation of the raw data.

The datum from all the data collection methods and all the participants was compared and then there was some comparison with the limited other studies. Finally, as previously discussed, the researcher accounts for the influence of the researcher through reflexivity (Green & Thorogood 2004). This will increase the dependability of the results. There is also a triangulation of data collection methods between participants to add further depth to the interpretation of the data, which should increase the credibility and transferability.

3.6.1 TRIANGULATION

Triangulation is important within health and social research, although it is acknowledged that there is some debate surrounding its feasibility (Sim & Sharp 1998). It has been suggested that it is impossible to effectively blend the two approaches because their philosophical and methodological origins are so different (Ritchie & Lewis 2003). However, other researchers agree that combining methodologies and methods can produce more meaningful results than can be achieved by one methodology or method alone (Parry 1991). Shepard (1987:1894) stated that the combined use of quantitative and qualitative research "can add tremendous richness and greater truth" and even went on to proclaim that combined "research strategies may be the single most important breakthrough in defining a body of knowledge that is unique to the practice of physical therapy".

Denzin (1989) would describe the approach adopted in this research as 'between method triangulation' as it involves the use of two distinct methodological approaches for data collection. In this research, a quantitative descriptive approach was used to develop a survey questionnaire which generated a profile of physiotherapy students' attitudes towards learning neurology. The qualitative follow up observations and interviews gathered in-depth individual physiotherapy student's experiences and ideas about learning neurological physiotherapy. In this way it is considered that the data collected complemented each other, particularly as the observations and interview discussions were in part directed by the questionnaire results. Each of the methods looked at different aspects in answering the research objectives to make use of the methods own strengths, which has been identified as one beneficial use of combining different methodological methods (Sim & Wright 2000).

3.6.2 MY REFLEXIVITY

As the module co-ordinator and one of the main lecturers in the topic of neurological physiotherapy on both the BSc and MSc courses, the students' experience, enjoyment and achievement are extremely important to me. This importance can be considered from the view of the school and university in terms of the successful teaching of the students, but also personally from the fulfilment and satisfaction of inspiring students to work in an area that I find so enjoyable. My role within the culture of the physiotherapy students studying at the participating HEI is established and the students will initially interact with me. We hence have a student-teacher relationship.

In a transparent vein I divulge the following assumptions. I perceive that neurology is a topic that is quite difficult to understand due to the amount of information that

needs to be assimilated from different areas of teaching (e.g. anatomy physiology, pathology, normal movement, as well as it involving so many areas of the body all at the same time) and I acknowledge that a fear of the complexity of the knowledge is understandable. But I also believe that anyone can do it. I want the students to enjoy the subject because I find it so interesting and challenging.

One of my concerns as the researcher was being able to clearly describe the actions of others, and interpret them appropriately, to ensure representation of the physiotherapy students' views. It is important to maintain a distance from the interpretation and prevent personal experiences and assumptions to dampen the voice of the students. Atkinson & Pugsley (2005:229) suggest that if you are familiar with the setting of the study, it is even more essential that you "suspend one's tacit cultural assumptions". This is potentially too challenging and actually to try and uncover those tacit assumptions and make them transparent might actually be more useful. The research should be rigorous and complete enough to try and prevent the misinterpretation that has become evident in some previous studies e.g. studies of delinquency and crime or sexual behaviour (Becker 2009). It can be argued that the misinterpretation in these types of studies is due to the behaviour and life style studied, that is unfamiliar to the researcher (Becker 2009). If this is the case, then perhaps the researcher being a physiotherapist might help with the interpretation of physiotherapy students therefore limiting misinterpretation because of the familiarity with some of their experiences and life styles. The triangulation of methods will also assist in the confirmability of the findings.

The lecturer and researcher dual roles have assisted in some of the interpretation of events. But it might have also challenged some of the fundamental assumptions of the qualitative approach. In essence the researcher is established in the lecturer role and part of the culture and this warrants further consideration of how

important it is to remain an outsider in order to achieve objectivity (Robben and Sluka 2007). Robben and Sluka (2007) discuss the problems with going 'native' and becoming part of the group being studied and perhaps some of these same issues apply to this case because the researcher is already native in a sense, not as a physiotherapy student but as a physiotherapy lecturer with past experiences of the culture of being a physiotherapy student. Observing another physiotherapy school rather than that of the researchers would eliminate the effects of being in a lecturer role. But it would still present challenges as the researcher maintains the mindset of a physiotherapist. As Swain (2006:208) identifies in his approach to researching children in junior schools, although he was researching in schools that he did not teach it was difficult for him to "shake off the role of ex-teacher". In this research the researcher discerns reflexivity issues throughout in order to achieve transparency in addressing these issues.

3.6.3 CRITIQUE OF METHOD

It is important to continually reflect and acknowledge the strengths and limitations of the research. I would like to reflect on how the study could have been undertaken with the benefit of hindsight. It is a possibility that more students might have volunteered for a focus group rather than individual interviews and the focus group environment may have promoted discussion of some common experiences. However, interviews were chosen to allow individualised exploration of perceptions and experiences (Ryan et al 2009). Although a follow-up focus group to explore these individual experiences and to refine any shared ideas might have been beneficial and would allow the students to hear and respond to diverse viewpoints (Plummer-D'Amato 2008a). It would have been important to carefully manage the groups, to prevent the stronger students dominating the group. The trustworthiness and rigour of the findings could also have been further increased

with a dependability audit (Plummer-D'Amato 2009) by involving another researcher to follow my process, although my supervisors did provide this monitoring to an extent. I could also have involved another researcher, as a critical friend (Elliot 1991) to analyse a sample of the data to verify the coding and themes.

Chapter 4 provides the findings from the questionnaires, interviews and observations, and the synthesis of results to determine the emergent themes to answer the research questions in Chapter 5.

4.0 FINDINGS

This chapter is structured in four sections. The first section provides a descriptive analysis of the questionnaire responses (4.1), and is followed by a second section detailing the observation notes and analysis (4.2), and then an analysis of the interview data (4.3). An example of the coding of the raw data from the three data collection methods is provided in Appendix 8. The presentation allows the transparency of the results, analysis and researcher interpretation. The discussion of the synthesised results under the emergent themes (4.4) in answering the research questions which takes place in Chapter 5.

4.1 QUESTIONNAIRE DATA ANALYSIS

A total of 25 students responded to the questionnaire from a potential 110 PT students studying at the participating HEI. The student respondents comprised of 6 year 1 MSc, 2 year 2 MSc, 2 year 1 BSc, 9 year 2 BSc, and 6 year 3 BSc students. This represents only a 23% response rate which is low. If this was conducted as part of a systematic quantitative study this rate would be unacceptable (Mangoine 1998), but this is not the case here. The results contribute to the picture of the students' experience of learning neurology and help inform the exploration using the observation and interview methods. Oppenheim (1992) recognises that postal questionnaire often produce response rates as low as 40% however this questionnaire was emailed to all the students, they had ample opportunity to return the questionnaire in the building, and still the response rate was only 23%. One reason for the low response rate could be that the topic is uninteresting or viewed as irrelevant (Sim and Wright 2000). If this were confirmed to be the case, it would be a very important finding in my exploration of students' experiences of learning neurology. I can only speculate why the response rate was

so low and I suspect it was because they have so many other assignments to be writing that it was deemed less of a priority and they could not see any immediate advantages to completing it. In addition to this not all respondents completed all the questions, this was often because they had not completed the teaching or placement for the subject and stated that they could not answer the question because of this. Some respondents did not expand on their answers or give alternatives in the comments boxes and I can only assume this is because they had nothing to add or because they did not have the time to do so.

4.1.1 Q1 – LEVEL OF KNOWLEDGE IN EACH SUBJECT

The first question posed was an opportunity to engage the students to consider how much knowledge they felt they had at that time in each of the 3 core areas of practice (Table 1). The majority of students (14 of the 20 who responded to this part of the question) felt that their musculoskeletal knowledge was either good or very good. In comparison to CVR and Neurology where only 6 students felt that their knowledge was good and 8 felt it was moderate. There were a number of students that felt their knowledge was either limited or very limited in CVR (8) and neurology (10).

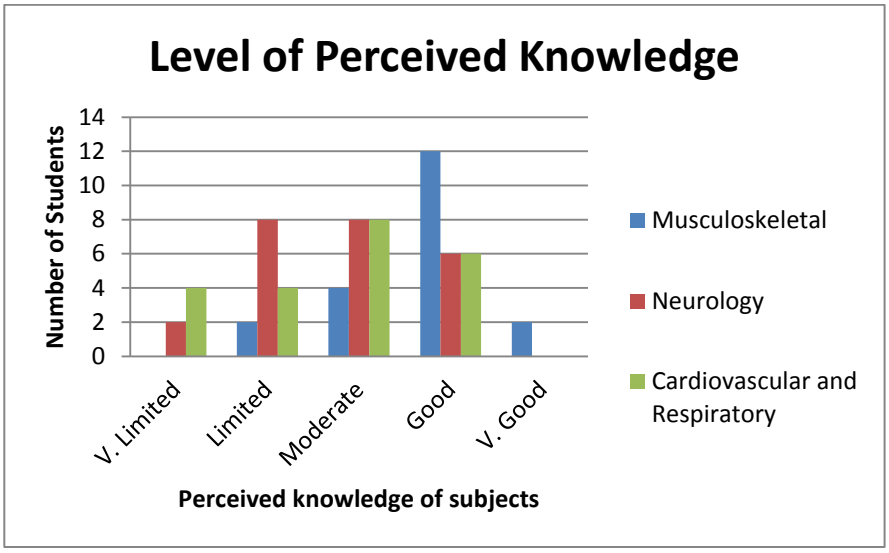


Table 1. Levels of Perceived Knowledge

Similarly to the response from the physiotherapy students, the majority of medical students in a number of studies (Schon et al 2002, Youssef 2009, Zinchuk et al 2010, and Sanya et al 2010) indicated that they also had the least knowledge in neurology. The physiotherapy students' perceived level of knowledge was actually comparable between both Neurology and CVR. Mindful of there only being 3 core areas to rate it is a more accurate summary to state that students felt most knowledgeable in Musculoskeletal.

The 3 subject areas chosen for the questionnaire are the umbrella terms and these subjects include a number of sub sections e.g. anatomy, physiology, pathology, assessment, management so there may in fact be some variation in the level of knowledge of different sub sections which is not reflected in the table. This also affects the direct comparison with medical students results as many of the subjects in the medical questionnaire are listed separately perhaps providing a more sensitive reflection of students' perceived knowledge.

The results in table 1 will have also been influenced by the stage of the course at which the PT students were at the time of administering the questionnaire because some of the students would not have completed their CVR and Neurology teaching and practice placement. In contrast they would all have been undergoing or completed their musculoskeletal teaching and practice placement. The breakdown of questionnaire responses for students prior to and after completing the relevant teaching block (Table 2 and 3) demonstrate a marked change in perceived level of knowledge as you would expect but it also re-demonstrates how similar the trend is for both CVR and Neurology, with no students feeling confident enough to declare having very good knowledge.

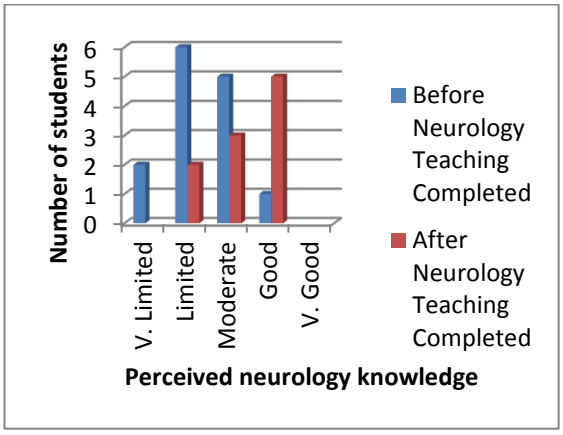


Table 2. Before and after neurology teaching

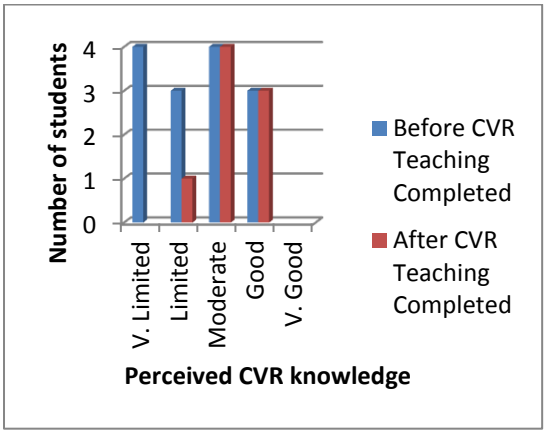


Table 3. Before and after CVR teaching.

It is appropriate to consider at this point that the musculoskeletal teaching is a much larger component of the course as it also incorporates many of the basic transferable PT skills that will be utilised in all areas of PT practice. This musculoskeletal teaching is also front loaded on both programmes which inevitably will positively influence their confidence in this area. It is possible that the students may not be recognising that much of what they define as musculoskeletal is also transferable physiotherapy skills to be utilised in other areas of physiotherapy.

When the students were asked to qualify the choice of level of knowledge, the majority simply stated which areas they had or had not had their teaching block and practice placements in. It did appear that the placement experience was the biggest indicator of increased knowledge, although some did note their academic and work experiences prior to the course. One student states;

> “the foundation to my previous degree was MSK, unfortunately neuro and CVR were only briefly touched upon”.

This infers that the ability to increase knowledge in neurology and CVR was affected by their level of prior knowledge. It was also noted that with increased knowledge came increased confidence;

> “we have studied musculoskeletal for a year now so I am much more confident with that. However we have not studied neurology or cardiovascular and respiratory physio yet”.

It is experience of the subject that increases the knowledge and in particular the importance of experiential learning on placement was recognised;

> “I feel I know less about neurology as we haven’t done loads about testing neural impulses and I haven’t had a placement in this area yet”.

> “At the end of each placement I felt comfortable in that field”.

This confers that the perceived level of knowledge from the student is determined by the teaching and experience they have received rather than how difficult it is to understand. I wonder if the amount of teaching will also influence the level of perceived knowledge because as previously stated the area with the largest curricula content is musculoskeletal. Leading on from this, the second question asks specifically about how difficult each subject is perceived to be.

4.1.2 Q2 – PERCEIVED DIFFICULTY OF EACH SUBJECT

Students were asked how difficult they found each of the 3 subjects. As demonstrated in table 4 the majority of students felt that neurology was either difficult or very difficult and it was perceived as the most difficult of the 3 subjects. It is apparent that only 1 student felt that 2 of the subjects (Musculoskeletal and CVR) were easy everyone else felt that all subjects were difficult or moderately difficult.

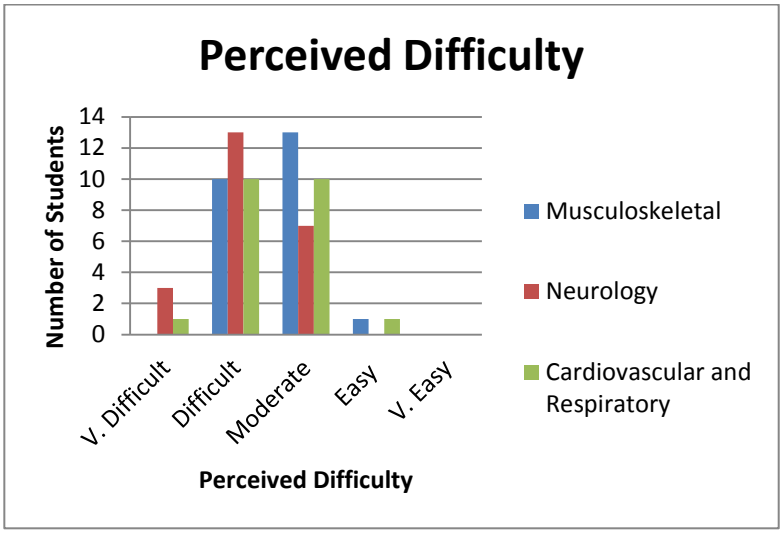


Table 4. Perceived difficulty of subjects.

These findings are in support of the findings of medical students. All the medical surveys found that neurology was rated the most difficult of the 7 or 8 subjects studied (Schon et al 2002, Flanagan et al 2007, Youssef 2009, Zinchuk et al 2010, Sanya et al 2010). Even though there were more subjects within the medical studies they consistently found that neurology was perceived as the most difficult.

The perceived difficulty for those students that had completed the neurology block of teaching was estimated following their teaching and experience. The difficulty reported by those students who had not completed the teaching block was expected to be an estimate of the anticipated level of difficulty. One student states;

> "I feel neurology will be very difficult as have no real experience in that area".

It is possible that the preconception of neurology being a stereotypically difficult subject is greatest prior to the learning experience, whereas the actual level of difficulty during and after the learning experience is less than expected, as seen in

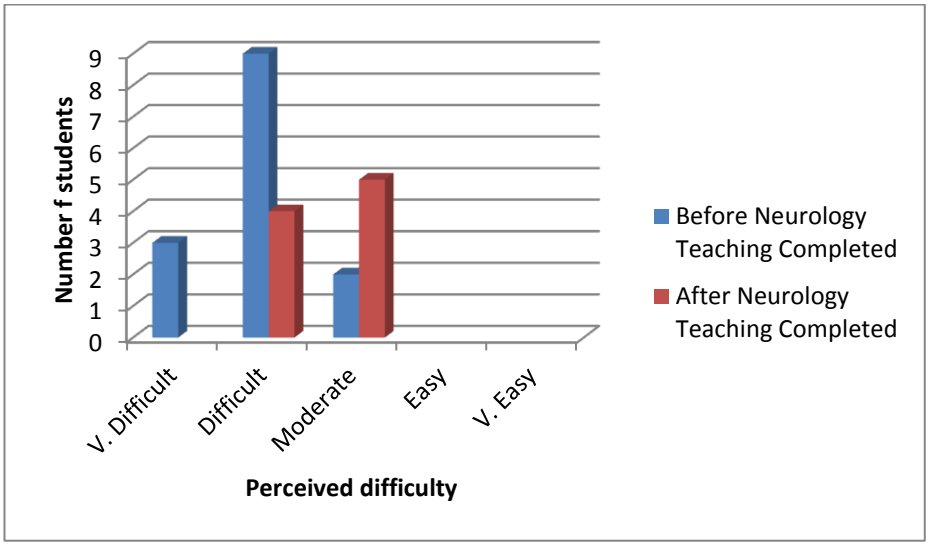


Table 5. Before and after neurology teaching.

One student initiates a link to neurophobia when summarising why neurology is a difficult subject;

> "I find neurology the most difficult as I have a fear of this subject due to the difficulty of neuro-anatomy and the fact that the brain is a complex organ, still not fully understood".

The fear of learning the subject was not the only reason given for the difficulty. The new terminology and the physiology of the neurological system were also reasons for its difficulty;

> "neuro more difficult as higher complexity of vocabulary and smaller to see and study".

> "I feel MSK is easier than neuro and CVR because the later 2 need more physiological understanding".

There were many more students than I had expected (9 students) who felt that all the subjects were equally difficult;

> “I find that all areas of physio present different challenges and so are difficult in different ways”.

> “I don’t think one area is more difficult than another, it just depends on the depth they are explored”.

> “I feel they are all difficult for different reasons. I struggle with physiology so have to work hard to understand it outside of lectures”.

Some students gave further details to explain the reasons for this difficulty. Many of these reasons acknowledge the different roles in each of the areas and the impact of treatment;

> “in MSK you are actually diagnosing the patient, in neurology you get patients with complex presentations and there are no specific time scales you can give the patient on when they will improve and you can’t be sure whether they will improve, in CVR the patients status can change rapidly and you need to be able to respond quickly an appropriately”.

This demonstrates quite a high level of understanding for the three subjects which will have been achieved through experience of the three areas. One student uses patient examples to try to highlight the difficulty in neurology, emphasising the long term impact of your intervention;

> “Neuro is difficult because e.g. when treating a child, the intervention that you give the child will probably have a long term impact on them in the way that they grow and develop. There is a window for treatment to have a big impact on physical functioning. This applies not only to children but also to adults e.g. those who have had a stroke”.

One student commented on the specific methods of learning and how neurology cannot be rote learned;

> “Musculoskeletal – It is possible to rote learn a large proportion of the knowledge and therefore just takes hard work and patience. Often the presentation is more specific and requires less clinical experience to diagnose and treat effectively.
>
> Neurology – There is so much to learn and very often presentation is not clear cut. Clinical experience is essential”.

This student is suggesting that clinical experience is even more important the more complex the patient presentation. And the rote learning of some musculoskeletal knowledge means that this is more achievable in the university setting.

The level of difficulty may well be influenced by the level of interest which is addressed in the next question. Students often come on to the physiotherapy programmes with an idea of the area they would like to specialise based on their previous experiences and areas of interest.

4.1.3 Q3 – LEVEL OF INTEREST

Students were asked to rate their level of interest in each of the 3 subjects. It appeared that although there was a spread of findings, there was a slight bias towards musculoskeletal as the most interesting subject. It was evident that within the very interested category it was neurology that had slightly more student responses, as seen in table 6. And on further investigation 6 of those students had completed their neurology teaching whereas 3 had not. In contrast, neurology was the only subject identified by students as being the least interesting, of those 4 students none of them had completed the neurology block of teaching.

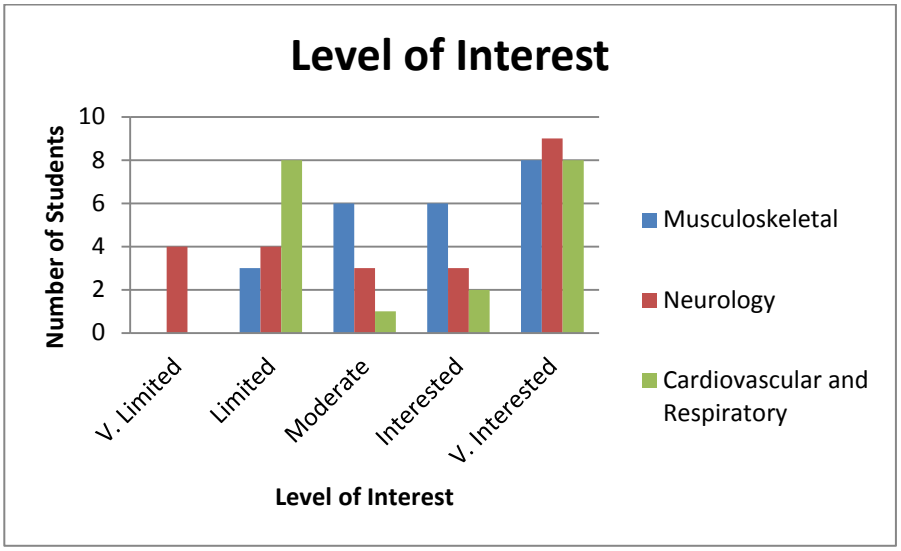


Table 6 Level of Interest.

There was also a variation uncovered in the medical student research and it was identified that neurology was often not rated as the subject medical students were the least interested (Schon et al 2002, Youssef 2009). For many of the PT students in this study, neurology was the subject they were most interested in. However there were also students that were most uninterested in it. There appears to be a real spread of interest in neurology, more so than in other subjects.

The level of interest has been the aspect that has shown the most wide spread opinions across all 3 subjects perhaps demonstrating that students will have a natural preference or affinity to a particular area of practice regardless of its degree of difficulty or complexity. It should be noted that 9 students did state that they were equally interested in all 3 areas, and that these were different students to those 9 who felt that the subjects were equally difficult. If these were the same students you might want to question the consistent level responses. These comments informed the questioning in the interviews.

In common with question 1 and levels of perceived knowledge, when the students were asked to qualify the choice of level of interest, it appeared that their placement experience along with their academic and work experiences prior to the course were the most influential. The interest in the subject is often determined by prior knowledge and experience, as suggested by these students;

> “I had previously worked in an area relevant to neurology, it was the reason I joined the course and still the patient group I most want to work with”.

Particularly when the experience was from practice placement;

> “Following a 2 week placement on a stroke rehab ward, I have been really interested in neurology”.

> “Neuro covered on placement I enjoyed and wanted to learn more”.

The lack of experience was also a factor determining level of interest;

> “I loved my MSK placement and what another student said about his neuro placement it sounded really interesting. I have no opinion on CVR yet until I experience it”.

For some students the lack of experience could be a motivator to want to learn more and therefore increase their interest, as suggested here;

> “My interest in neuro is mainly due to lack of experience so far”.

Some students explicitly acknowledged that the lack of teaching experience was actually stimulating more interest;

> “Having not fully studied neurology and cardiovascular and respiratory physiotherapy I am excited to learn more about them”.

There were minimal students commenting on the type of patients treated in each subject area as influencing their level of interest;

> “stroke victims seem to heal themselves”.

Although this student implies that they are unclear what the physiotherapist role will be as their understanding is that stroke patients will heal themselves. This could be an indication of a preconception or a misinterpretation of information. It also suggests that this student has not completed the neurology teaching block and potentially had a limited awareness of the physiotherapy role in all the core areas of practice. There was evidence of students that had a preference for musculoskeletal which is arguably the most well-known area of physiotherapy practice;

> “I have always known that MSK and sports is my passion. I find neuro interesting because it is closely linked with MSK. I don’t identify myself with CVR”.

One student with an obvious interest in neurology attempts to justify what is particular to neurology that makes it so interesting;

> “I like the fact that with neuro patients in sub-acute setting you can spend longer with the patient and really make a difference in helping to improve their function and you can see the improvements”.

This student’s reflection indicates that the student has had some practice placement experience specifically in the sub-acute setting which has sparked their interest. The context that specialist physiotherapists work was also identified by another student as an influencing factor;

"I am more interested in neuro and CVR as I prefer working in an acute inpatient setting. I find that these 2 areas capture my interest and I am motivated and want to learn more about the areas".

Students interest in different subjects varies which is ultimately beneficial for the profession as these students will apply for different roles within the workforce. The level of interest expressed does appear to be linked to the experiences of the students which might lead one to suspect that the amount of experience will also be linked to the level of confidence; therefore the subsequent question was posed.

4.1.4 Q4 – LEVEL OF CONFIDENCE IN EACH SUBJECT

The students were asked how confident they would feel treating a patient in each of these 3 subject areas. It is not surprising perhaps that the area students felt most confident in was musculoskeletal as this is the area that they have had the most experience through university based teaching and practice placements. The area that students felt most uncertain about was CVR rather than neurology.

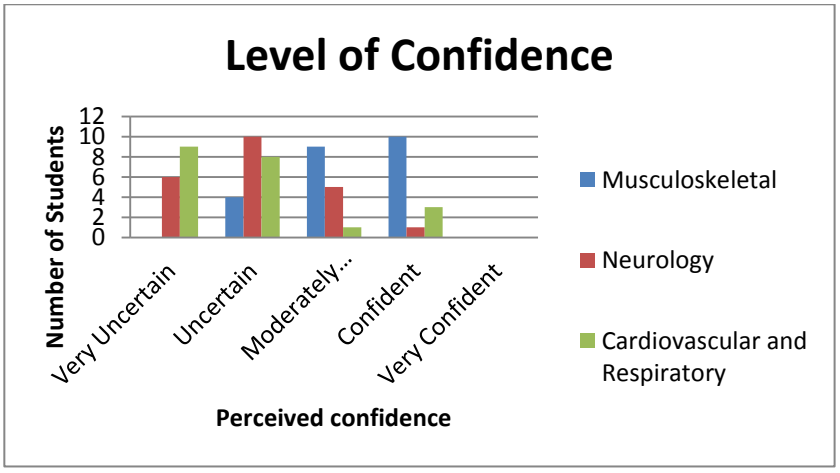


Table 7. Level of confidence.

The congruence between current physiotherapy student findings and previous medical student findings is less for the topic of confidence in assessing and treating patients from each subject area. Whereas the physiotherapy students felt

least confident in CVR, all the medical students studied felt least confident in assessing and treating neurology cases (Schon et al 2002, Flanagan et al 2007, Zinchuk et al 2010, and Sanya et al 2010).

The level of confidence was greater for the students that had completed the teaching blocks for CVR and neurology however there were still a number of students that felt they had very limited confidence in assessing and treating patients/clients in these clinical areas. This can be seen in Table 8.

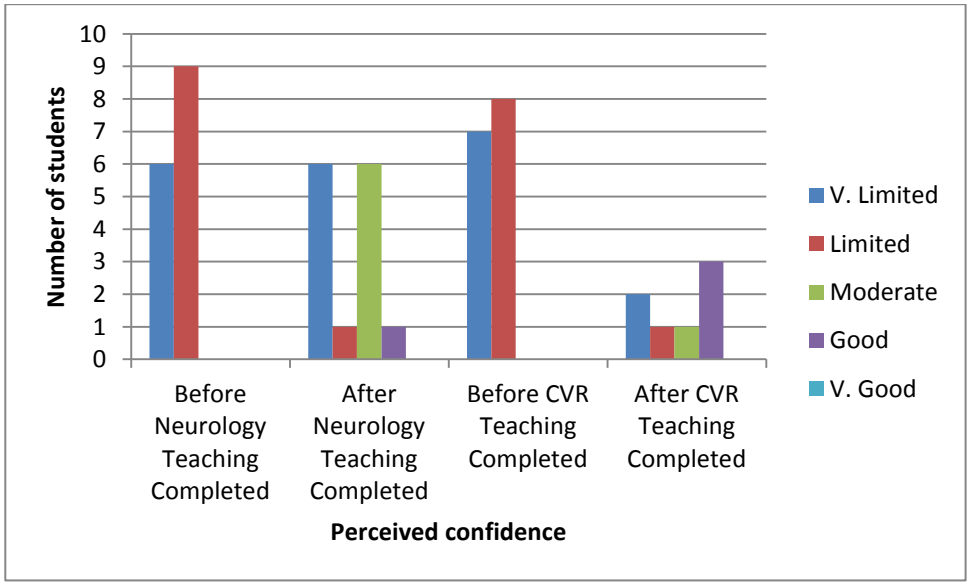


Table 8. Confidence before and after teaching completed.

In the justification of the responses, the important role of practice placement was again emphasised as the predictor of confidence, as evidenced by these student comments;

> "I am confident in musculoskeletal assessment, diagnosis and treatment as I have completed a placement and so have seen real patients whereas I have had no experience of patients with neurological or CVR problems".

> "Practise with patients will increase confidence over time".

> "Personally I learn best via patient mileage".

One student went as far as to suggest that all the learning happened during practice placements;

> “Not done any placement on Neuro or CVR. I don’t learn anything at uni”.

This student’s perception of the learning in university is insignificant in comparison to the placement learning. They might also be alluding to some lack of respect for the university based teaching or some disengagement with the teaching. The limitations of the questionnaire approach mean that these issues cannot be explored for this student, although these valuable insights helped to inform the researchers thinking going into the interviews.

It is very unlikely that students can feel confident in assessing, diagnosing and treating patients if they have not been taught to do so. This is the purpose of the teaching and many students concur with this notion;

> “I’m uncertain as I have yet to learn any assessment techniques/pathology or how to examine a patient”.

It is also evident that students can feel more confident in some aspects of the subject and not others and it would seem the question structuring has not been sensitive enough to reflect this, as suggested by these student comments;

> “Moderately confident for neuro due to lack of knowledge about treatment. Assessment – would be more confident”.

> “MSK – not confident in assessment and diagnosis, but ok with treatment
> Neuro - I’d still need to build confidence if working in an acute setting (my placement was community) but feel quite confident in knowledge
> CVR – I feel I know enough basic principles to treat resp patients”.

> “Despite the wide variety of presentations and causes of impairment in Neurology I feel I would be able to treat the symptoms but be less skilled with diagnosis”.

There were also students that had completed the teaching but remained lacking in confidence, musculoskeletal is the example here rather than neurology;

> “I feel very well informed surrounding musculoskeletal assessment and treatment but lack the confidence in myself to use the knowledge in myself to use the knowledge correctly”.

> “MSK = trouble with diagnosis”.

The students level of confidence was difficult to define due to the number of elements e.g. assessment, diagnosis and treatment. It was clear though that the level of confidence was explicitly linked to the teaching and practice placement experience, although preferentially the placement experience and including how recent the experience was.

The next question in the questionnaire asked the students about potential reasons for neurology being perceived as difficult.

4.1.5 Q5 - REASONS FOR PERCEIVED DIFFICULTY

The questionnaire provided a list of potential reasons for the difficulty in learning neurology which had been defined in previous medical student research (Schon et al 2002 and Flanagan et al 2007). The physiotherapy students could indicate if they felt each of these items was a major contributor, minor contributor, or not at all as a reason for the difficulty learning neurology, as seen in Table 9. There was also opportunity for the students to add to this list and provide additional reasons for any perceived difficulty. These suggestions could be personal reasons or

reasons they perceive others find the subject difficult as the question was left quite open.

	Not at all	A minor contributor	A major contributor
Neuroanatomy	3	12	7
Neuropathophysiology	1	10	7
Complexity of treatment approach	3	9	9
Poor teaching	8	5	7
Many complex diagnoses	0	12	9
Limited exposure to neurological patients	2	4	15
Not enough teaching	3	12	5

Table 9. Reasons for perceived difficulty.

The most significant factor identified as a major contributor to the difficulty in learning neurology was the ‘limited exposure to neurological patients’. The exposure to patients during the university teaching block is very limited and therefore what the students are highlighting here again is the importance of practice placement experiences. The other factors received mixed responses from the students and the only factor that every student felt was either a minor or major contributor was the ‘many complex diagnoses’. There is another link being exposed here that was discussed earlier in the questionnaire results, as the students feel the complex diagnoses and the lack of patient contact to be the most

significant issues. Previously it was suggested that the placement experience is most important for the more complex patients.

In addition to the factors identified in the questionnaire (Table 9) students also identified that barriers to communicating with patients influenced the perceived difficulty of the clinical area:

> “Difficulty communicating with some patients (more so than any other area)”

> “There are often a variety of communication difficulties to overcome when working with patients with neurological deficit, as well as the challenges that present when treating all patients”.

This could be linked to the complex diagnosis, but more specifically it is the manifestation or presentation of the patient following the complex neuropathology. Communication disorders are a common occurrence following neurological conditions, for stroke alone studies have found that the prevalence of dysphasia can be between 25-70% of all patients (ASPHA 2013), which can be challenging to work with. Another example of an aspect of the patient’s presentation adding additional pressure for the student learning neurology is their level of illness;

> “Normally msk patients are a lot more medically stable than neuro or resp, so they are easier to sub and objectively examine”

It seems the amount of personal experience of people with neurological conditions is also significant;

> “It’s difficult to grasp the concept if you have not experienced or lived with neuro patients before”

This comment seems to go beyond having practice placement experience and implies learning neurology is difficult if you are unable to empathise with patients

through lack of personal experience. It could be suggested that students are much more likely to have experienced or know someone who has experienced a musculoskeletal problem, whether that be a sprained ankle, broken bone or arthritis. This might mean they are more able to make links and empathise with the situation. Neurology as a topic is not as familiar to students unless they have some experience through previous teaching, which it appears is quite limited;

> “It’s an unknown topic, that you only have limited knowledge in from A levels and yr 1 HSY topics”

> “limited experience prior to university and minimal hours dedicated to neuro”.

This is another example of reference to the amount of teaching which is allocated to each of the subjects and the fact that the neurology block of teaching is much shorter. Although the question does not ask for it, there is no acknowledgement of the transferable skills that are learned through the musculoskeletal block of teaching that are also used within neurology.

The statement above has been highlighted from one of the questionnaires, not because it is saying that neuroanatomy is difficult because, the results already indicate that many students do find it a difficult subject, but because the student does not feel it was needed for practice placement.

> “It got more confusing the more neuroanatomy you do – but I didn’t really need that for placement”.

This student’s comment could be implying something much more important, that actually they feel the teaching is being made more complex than it needs to be, and that the level of detail taught is not required clinically.

One student identifies an additional reason for the difficulty learning neurology as;

> “limited functional anatomy”.

The student is referring to the integration of the neuroanatomy with the function and presenting symptoms of patients. This is an interesting comment to make because this student is right by inadvertently acknowledging that none of the reasons given on the questionnaire identify the problems of integrating knowledge to make sense of the patient presentation, which is essential in order to perform effective clinical reasoning (Higgs et al 2008). Particularly as this is the essence of the initial definition of neurophobia provided by Jozefowicz (1994). The difficulty may well lie in the ability to link all of these individually difficult aspects of learning neurology together in order to assess, diagnose and treat patients.

In addition to the points illustrated above some students chose to elaborate on issues that made the subject more difficult to learn, in particular identifying the treatment approach and the terminology used;

> “there is not one set treatment approach for the certain pathologies and educators/clinicians tend to use different ones”.

> “lots of new anatomical language”.

Finally the questionnaire asked students to reflect on these difficulties and suggest ways that students could be better facilitated to learn neurology.

4.1.6 - Q6 OVERCOMING DIFFICULTIES WITH LEARNING NEUROLOGY

Many students felt more neurology teaching time was required, 6 students explicitly stated this, but in addition one student suggested;

> “also given more time between them”.

This implies that not only do students need more information and time to understand this difficult area but time between sessions is required to assimilate the knowledge to inform the next session. The additional neurology teaching time it appears would make the students feel better supported;

> “so given more dedicated neurology teaching time then they may feel more supported in this area and may overcome their difficulty in this subject”.

The pedagogy of teaching also attracted attention, with suggestions for methods that appeared to be using the full range of senses and learning needs;

> “teach more using interactive methods such as dissection, role play, placement, visual lectures”

> “a neurology theory workbook like ‘an intro to neurology’”

> “diagrams are very useful”

The size of the teaching groups also appeared significant and small groups were preferable;

> “small group workshops and case studies”

The issue of revisiting and revising information was seen as favourable;

> “go over it more often”

There was strong feeling that teaching should involve more real life situations. The students again, acknowledged the importance of clinical experience and the compromise during university teaching. These comments illustrate how strongly students feel about patient interaction as a learning experience;

> “better teaching including more examples including real patients or video recordings of”

“expert patients used during teaching period”

“meet neuro patient”

“more exposure to neurology patients”

“practise with neuro patients. We had one experience of this before going out on neuro placement and it was very helpful”

Interestingly one student feels the transferable nature of physiotherapy skills should be more explicit;

“more lectures on integrating neurology concepts to other areas i.e. MSK”.

Another student comments on the course structure and ordering of the teaching and suggests;

“start doing more neurology in first year to prepare for second year”

Finally one student highlighted that the differing expectations of the student on placement and the newly qualified physiotherapist working in neurology should be made explicit as a means to decrease fear;

“students should understand that they won’t be expected to deal with complex cases as students and even as juniors and that you just need to know the basics to begin with then you progress through placements/staff grades you learn and develop and build up to treating the more complex patients”.

4.1.7 CONCLUSION OF QUESTIONNAIRE FINDINGS

It is apparent that the confidence and knowledge of an area are linked to the enjoyment of the subject more so than the difficulty. One year 3 BSc student sums this up when stating;

> "Neurology and CVR are the two areas of physio that I enjoy most, therefore I feel more confident in these areas, which makes me feel that my knowledge in these areas is better".

These findings also overwhelmingly suggest that the practice placement experiences are the most important environment to learn and consolidate knowledge and clinical reasoning. This is also supported by research and the professional body requirement that students successfully complete a minimum of 1000 clinical hours.

The key findings from the questionnaire responses in relation to the research questions have been listed below. These will be considered later with the observations and interview findings.

What are students' perceptions of the area of neurology?

- Neurology is considered difficult but many students recognise that all areas have difficult elements.
- There is a spread of level of interest in neurology. Students are still interested in neurology even if it is considered the most difficult. Their interest is influenced by their previous experiences.

What are the students' experiences of the university based learning of neurological physiotherapy?

- Neurology knowledge is influenced by the amount of teaching and experience a student has had, both professionally and personally.
- Student's confidence in managing neurological patients is influenced by their level of interest and the amount of teaching and practice placement experience they have received.
- There have been a number of additional reasons for the difficulty in learning neurology identified ranging from the process of integrating knowledge and clinically reasoning patient presentations to the new terminology, medical instability of patients and lack of definitive treatment approaches. This highlights that this is a multi-faceted problem warranting further investigation.
- The diverse suggestions for improvements to the teaching to facilitate students to overcome the difficulties of learning neurology included strategies to involve more real life situations that would develop the real life clinical reasoning, integration and transfer of knowledge required to effectively treat patients. There were also strategies suggested that would capitalise on students' differing learning styles.

The process of assigning the findings to the relevant research question has highlighted the overlaps, as it is possible to place some of the issues under both questions. There is an inherent link between them. The students' perceptions of neurology and their experiences of learning neurological physiotherapy will directly influence each other.

4.2 OBSERVATIONS DATA ANALYSIS

I undertook four observations of neurology related teaching sessions led by different lecturers. The observations were deliberately all very different i.e. different lecturers, different topics, size of sessions and different pedagogies. This was in addition to taking observational notes during and after my own neurology teaching sessions. The data gathered from these observations are presented below.

Having been a Lecturer in Physiotherapy for 8 years and observing many teaching sessions and being observed myself, I did not document all of the descriptions of the sessions, I just noted those behaviours and comments that were out of the ordinary. On reflection, I did ask many of the questions advised in Emerson et al's (1995:170) suggested 5 sets of questions to consider when writing field notes; I did note what people were doing, how exactly they were doing this, how people understand what is going on, what assumptions are made, and finally my analytical questions considering why this is important and what I learned. An edited version of the key issues observed is presented on the following page. This gives the overview of the variety of settings, topics, and pedagogy, along with my initial interpretations. This is followed by a discussion of the key findings in relation to the research questions.

	Lecturer A	Lecturer B	Lecturer C	Lecturer D
Topic	Neuroanatomy	Neurophysiology	Applied Psychology	Practical skills
Type and duration	1 hour formal lecture in lecture theatre.	1 hour seminar with small group tasks.	1 hour seminar session- student led.	2 hour practical session in practical room.
Number of students	65 mixed group of OT and PT year 1 BSc students	22 mixed OT and PT year 1 BSc students	Mixed group of 23 OT and PT year 2 MSc students	20 year 2 BSc PT students
Behaviour observed// my interpretation	Lecture theatre – similar seating to all other lectures observed; students at front were most engaged and many were mature students. Students at back were much less engaged and tended to write notes and chat at any opportunity// topic did not seem to influence the 'normal' dynamics of the room	Small discussion groups- students who led the discussion tended to be those who can covered the topic at A level (mostly PT's), others quite quiet (mostly OT's)// This was representative of most sessions except the PT/OT divide in knowledge level was quite noticeable	OT students more confident discussing the psychology theory in front of the group// PT's had less prior experience of psychology, but they still engaged with the group appropriately	Students happy to discuss what they would do but needed several prompts to do practical practise// appeared to feel more confident in the planning than the execution of the task. Role play -when pretending to be the patient and PT, many students did not know what to say or giggled a lot// Students appeared to feel awkward, self-conscious and coped with this in different ways.
Comments made during the session// my interpretation	There were many questions about the brain function being presented that were appropriate but indicated that there was a general sense that students were finding it difficult to learn//remember the brain functional anatomy.	No specific comments overheard but noted that the majority of PT students were talking whilst majority of OT students listened initially, although OT students confident to ask questions for clarification	Many of the students, particularly OT's discussed their psychology 'A' level teaching// This appeared to increase confidence as they were familiar with concepts and had some basic knowledge as a grounding	No specific comments were made that I heard but there were numerous awkward silences and nervous giggles around the room
Notes	Nothing overtly different in this observation to observations of other topic areas, except the amount of questions clarifying the information.	Students using prior knowledge were more confident to share their knowledge in the small groups	I wondered if the amount of previous exposure to the relevant knowledge increased students confidence, acting as a buffer to build new knowledge	I wonder if the unnerving feeling of the role play is because they are unable to empathise with neurological patient presentations due to lack of experience.

Table 10 Observation notes.

The observations of the four different neurology teaching sessions initially appeared no different to any other sessions I have observed. However, when I considered the potential meanings for some of the comments and behaviours observed it highlighted a number of interesting issues which can supplement the exploration of students' experiences of learning neurological physiotherapy.

The unusually high number of questions clarifying different functions of the areas of the brain in the lecture theatre was a behaviour that indicated to me that the subject was difficult for the students to comprehend. This may have been because the topic was complex and new to the students. It was good to observe that many of the students were motivated to gain understanding and therefore pursue the questioning to make sense of the information. This suggests that the students perceive the information to be important, and they are motivated to learn, and could indicate a good level of interest in neurology.

In the two student-led and small group activity sessions there was a strong sense that student confidence was borne out of their familiarity with the topic and the relevance of their prior knowledge. The physiotherapy students in the neurophysiology seminar were more confident generally than their occupational therapy colleagues presumably because they had studied nerve conduction during their 'A' level's. Whereas the occupational therapists in the applied psychology seminar appeared more confident than the physiotherapy students as they had greater psychology and other related experiences. This resonates with the concept of transfer during learning being one of the key cognitive processes (Schunk 2012). The students are able to learn the new information more readily and feel more confident in this because they are able to positively transfer prior learning in order to facilitate new learning. It is also important to consider that prior learning and knowledge does not always have a positive effect. Negative transfer occurs

when prior learning interferes with the new learning (Schunk 2012). Previous learning can include informal learning through experience and will be laced with presuppositions which could interfere with the new learning (Atherton 2013). The opposite appears to be happening in the example of the practical class and the use of role play. The students do not have previous experiences or learning related to patients with neurological conditions and therefore found it too challenging to act and empathise as the hypothetical patient case. The result was a sense of awkwardness displayed by the students and the coping strategies and behaviours observed were uneasy long silences and nervous giggles.

Notes from observations made during my own teaching.

The observations of behaviour and comments made during my own teaching sessions were recorded much more informally and infrequently. This is because the primary focus of my time was delivering the teaching, and learning experience of the students. I tended to note any behaviours and comments that evoked an emotional response from me because they were unexpected or extraordinary, or obviously linked to the notion of neurophobia and therefore bought me back to the significance of my studies. These notes were also much less structured and were often just a sentence or two sketched onto the side of my lecture notes.

4.2.1 - OBS 1

In the second practical session for the second year BSc cohort, one of the students asked me:

> “I really like pictures to copy from, which textbook could I buy that will show me all the treatment techniques”

This really highlighted to me that the student was expecting to be told and demonstrated the answers (techniques) to the problems. It made me realise that this was possibly the preconception that students arrived with and that they did not appreciate before they started the teaching block that there might not be black and white answers and techniques for every presentation and actually a problem solving approach using all their available skills and tools was what would be required.

We had a discussion about the available textbooks and the merits of each, but we also discussed the approach used in neurological physiotherapy and the student started to lose the look of excitement on her face and it started to turn to a confused look as she said;

> “But you will show us where to put our hands so that we can copy you and practise, so we know if we’re doing it right?”

This made me realise that this had been the teaching style for previous musculoskeletal practical sessions and what I was asking them to do was not only to learn new information and approaches but to also learn it in a new format. Because although the case study approach had been used by students before, this had not been the sole approach, it had been used to check and consolidate knowledge, rather than to integrate learning and facilitate problem solving of new material. I also realised that the student had come with the perception that there would be specific handling and techniques to learn.

4.2.2 - OBS 2

Having completed the majority of the teaching block, and asking the students what they would like to cover again or practise in a consolidation session prior to their practice placements, one student said;

> “Can you show us how to assess a patient?”

This was met by lots of nodding and “yes” from the students which implied that the whole class had not felt they had learned how to assess a patient, which was the first skill we had addressed in the teaching. I followed this up with a qualifying question and was told;

> “I wouldn’t know where to start assessing a neuro patient because we’ve never done it.....well .....We have been told about bits of it and tried bits out but no-one has told us exactly what to do and what order to do it in”.

I believe the pause was because I had taught them the theory, although not the practical, so they had to check what they were saying, in order to avoid offending me. The conversation with the group continued and the group acknowledged that actually they had practised assessment and they did know that they had the skills to do the assessment but they felt very unsure and wanted additional time to practise. It transpired that they were anxious because of the short amount of time they had to consolidate the information and that they felt more confident with musculoskeletal assessment because they had been using it for so long.

When I asked the group if they could assess a neurological patient solely with their musculoskeletal skills, they initially felt very unsure but after a long silence, the group started to verbalise that actually;

> “I guess we can use what we feel confident with, um, I know how to assess the joints and strength etc, so I could, well I could assess something, but there’s so much to do, it’s knowing where to start?”

I could physically feel and see the group starting to relax and at this point we practised the neurological physiotherapy assessment. The students felt much more confident having practised skills they already felt confident in, with the addition of the neurology specific parts of the assessment.

4.2.3 - OBS 3

During a practical session where the students were working in small groups to problem solve how they would help a stroke patient to move from sit to stand, one of the students was overheard to say to her group;

> “But this is just telling them how to move or pulling them up, what’s so difficult about that?”

When I observed what the group was doing they were doing exactly that; telling the student role playing the patient how to stand up. It was as if they had not appreciated that the marked lower limb weakness described in the case study would prevent them from being able to do this. When I suggested that the patient would not be able to do this, the group did not appear to reason why, and where the patient would need to be handled to assist the movement. Instead they just offered a hand to hold and told the patient to stand again. The role playing student obliged as she was unable to imagine and re-enact the level of weakness the patient would be experiencing.

When I suggested that the hip extensors would be weak and you might want to think about strengthening those and handling from the hip during sit to stand, one of the students in the group said;

> "I know we could get the patient lying prone on the bed and do some resisted hip extension".

This highlighted to me again that the group were unable to reason through these problems as they just couldn't imagine how the patient would actually be presenting. If they had realised they would have seen that getting this patient into prone lying to do exercises would be too difficult and actually doing some strengthening through guided weight bearing functional activities would be much more realistic and beneficial. The students were using the knowledge and skills they felt confident with from their musculoskeletal teaching and placement, but were unable to clinically reason how they could adapt these skills to the stroke patient because they were unable to imagine how the patient would present and the student was unable to role play convincingly. The transfer of learning and skills in this situation was literal but it actually required a high road, forward reaching transfer (Schunk 2012). Rather than just applying the same strengthening technique used with a musculoskeletal patient to the neurological patient, the principles of the strengthening technique needed to be considered in the context of the patient presentation and applied new a different way. This might be an expectation that the lecturers have of the students that is actually too challenging at this stage in their training. As Schunk (2012:321) highlights "forward reaching transfer is unlikely when students have little knowledge about potential transfer contexts", in this case the context of the neurological patient.

4.2.4 - OBS 4

Towards the end of the neurology block of teaching for the BSc students there is a session where they get to meet and work with a patient volunteer in small groups. This is always a session much anticipated by the students and which receives very positive feedback. The session began with the patients joining the students in the practical room and at once the students all stepped back from taking the lead. The behaviour of one of the group of students demonstrated great anxiety. They were slow to ask questions and help the patient feel at ease, and even though they had been asked to prepare how they would use the time, it appeared as if they had all just been thrown unexpectedly into a room with their patient! There were long lengths of silence as each student waited for another to initiate a conversation. The faculty member supervising the group recognised this unease and felt it may be due to the obvious disability of the patient and her reliance on the electric wheelchair, so decided to intervene and help guide the subjective assessment and determine the level of ability of the patient to transfer from her chair.

I returned to see the group 30 minutes later absorbed in discussion with the patient and her friend and to see the group of 5 students all huddled around the plinth that the patient was lying on waiting for their opportunity to feel the high tone in her legs.

This observation helped me to remember how daunting neurological patients can be with their complex presentations and how very important experiential learning is. These students could only talk about high tone in class but could never imagine it; they needed to experience it, in order for this to be considered during their assessment and treatment planning for a patient.

4.2.5 CONCLUSION OF OBSERVATION FINDINGS

There were a number of key issues that emerged from the observations, which have been summarised below under the research questions;

What are students' perceptions of the area of neurology?

- Some students were quick to be dismissive of the use of normal movement as a treatment technique, as they felt this was too easy/general and that the more specific techniques in musculoskeletal were superior.

What are the students' experiences of the university based learning of neurological physiotherapy?

- Students' behaviour is very similar in neurological theory sessions to sessions from other topics suggesting that there is a mix of experiences, interest and motivation for the subject. Although the number of questions suggested many of the students needed to seek clarification to understand the subject.
- Students find the role play of assessment and treatment of neurological patients very challenging which is seen as awkward silences and giggles. This may be due to their inability to empathise with the patient example.
- The students struggled to see that they had learned the assessment/ technique unless they had the opportunity to watch, copy and practise, in a very didactic way.
- Students wanted to know specifically which techniques to use for each problem and when this didn't happen it caused some anxiety.

- The intense short block of teaching left some students feeling anxious that they had not had enough time to learn all they needed to in preparation for placement.

- The use of patients in teaching put all the teaching into perspective and students acknowledged the challenges of teaching and learning neurological physiotherapy on each other. They also valued the opportunity for this experiential learning.

4.3 INTERVIEWS – DATA ANALYSIS

This section firstly provides a diagrammatic representation of the results followed by a descriptive summary of the interview findings. In the brackets following each of the codes and categories I have provided the number of students from the total of 15 that made reference to this e.g. if it was 4 people who made comments pertinent to the topic 4/15. This attempt to quantify the results is to give a sense of how common each issue was for the group and therefore the case being studied. The verbatim quotes from the students have been included as evidence, transparency and justification for my interpretation.

On the following page is a diagrammatic representation of the themes, categories and codes.

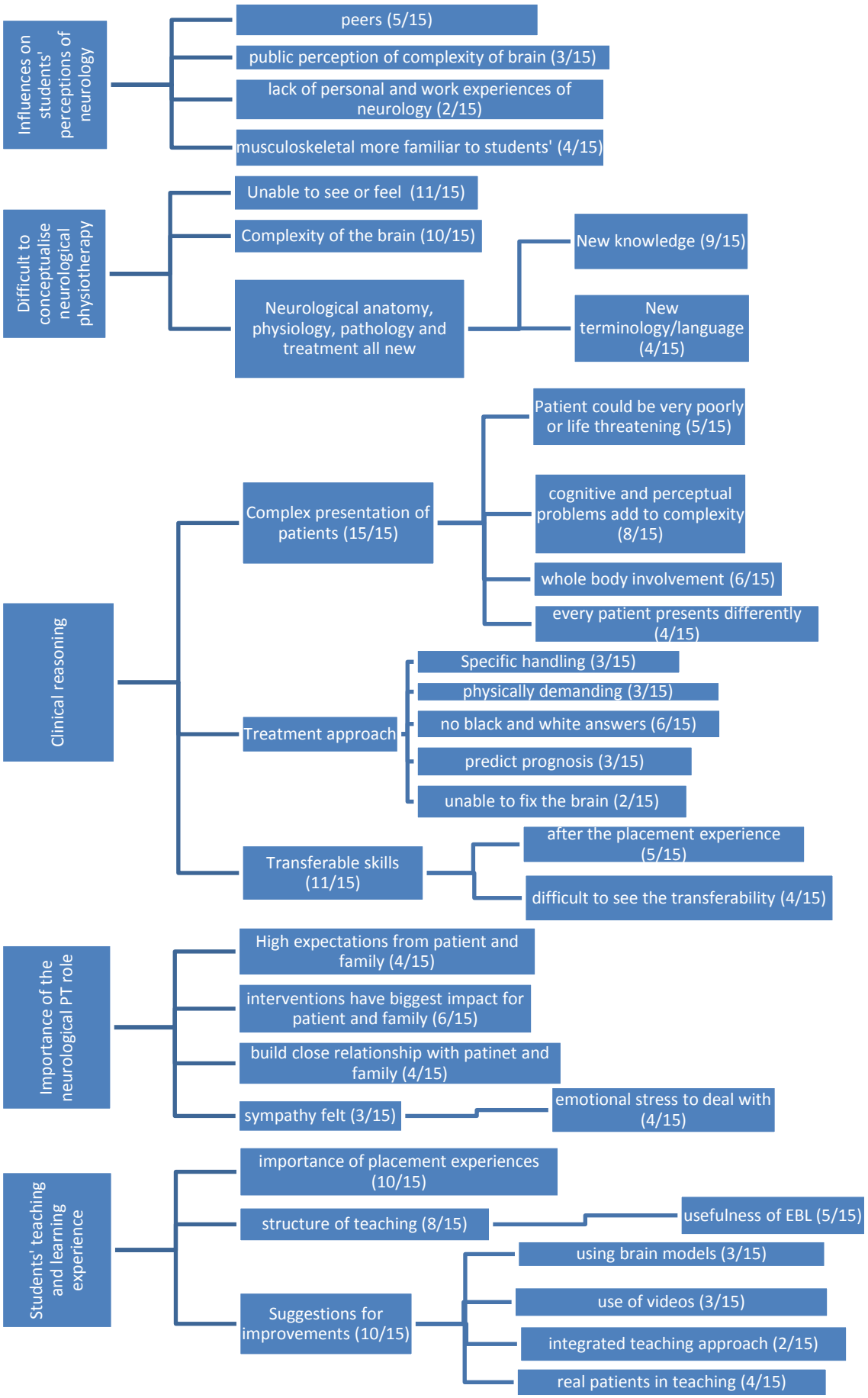


Figure 4. Interview codes and themes

The interview data was analysed allowing the inductive emergence of themes identified also under the influence of my own experiences and knowledge from the literature. The findings were later synthesised with the other data collection methods and analysed holistically to answer the research questions. This can be found in Chapter 5.

4.3.1 DIFFICULTY CONCEPTUALISING NEUROLOGICAL KNOWLEDGE.

There was an overwhelming sense that it was difficult to conceptualise neurological knowledge. This was because students were being asked to do something new, in that they had to learn about things they could not see or feel (11/15), the hidden nature of the structures, physiology and causes of symptoms were central to this difficulty.

> “The areas that are more difficult to learn are those like respiratory where you can’t see and feel the area being treated e.g. lungs, and for neuro the brain. – it is quite abstract” (A)

> “When learning brain lobes etc it’s difficult to apply and visualise” (C).

> “it`s quite hard to visualise the brain what`s going on and when we think about muscle and limbs other things that is a bit easier to visualise what`s going on and this with the brain not quite the same”. (E)

The use of vision and touch (kinaesthetic) in learning neurological physiotherapy skills is compared to musculoskeletal skills. The assumption here is that musculoskeletal is easier to learn as you can see and feel it. This places a strong emphasis on visual and kinaesthetic learning strategies and links to some of the

suggestions for improvements to the teaching experience suggested in section 4.1.6.

> “it’s so abstract you can’t really seem to put your finger on it to, you know, you feel the muscle, you feel tendon, you feel the bones. The same with the lung, we saw the lungs, we saw the heart, but the neuro was just the brain”. (F)

> “For pathology Msk symptoms are quite visual e.g. joint swelling but for neuro more difficult to see whats going on in brain so you just have to accept it’s happened and caused the presentation e.g. limb weakness” (C).

For many students it was significant that the neurological anatomy, physiology, pathology and treatment was all new (13/15),

> “A lot of the muscle physiology and stuff I had done numerous times before but that was all brand new and I think we go over things at quite a quick pace as well and yeh I think I’m, a combination of things, I think” (H)

A key issue was that the knowledge to be acquired was all new (9/15).

> “but the amount of new information for some was overwhelming” (D)

> “I think it’s just you’re learning something different, something new, um, but I’ve loved it just as much as everything else” (M)

The challenge of learning neurology was often described as being attributed to the new terminology/language (4/15).

> “there’s lots and lots of Latin names on everything that goes up and goes down....It’s literally like learning a new language (F)”.

These were also highlighted in the questionnaire responses, as well as previous medical student studies (Hudson 2006). One of the key underlying issues discussed in relation to the amount of new knowledge was also the unfamiliarity of the new information, which might suggest why some students felt it was like learning a new language. They feel they have no prior knowledge to build upon therefore the new learning is seen as difficult and effortful. One student explains this:

> "I guess um.. we haven't done neuro as much so it's all completely new to me, for the MSK I did PE so it's kind of when we think about muscles and stuff I think of yes you use that when you throw a ball and stuff. And when I thought about doing the course they have me a book, atlas of skeletal muscles which I looked at so it was familiar, whereas neuro was just so completely new to me" (J)

The familiarity of the topic and the terminology was dependent on previous learning. In the example above it was experience gained during 'A' levels. However, personal experiences of people with neurological pathologies were also noted as increasing familiarity with the topic.

Another issue highlighted by students that contributed to the difficulty with learning neurological physiotherapy was the complexity of the brain (10/15), both actual and perceived.

> "Neuro was definitely fearful because of the brain and not knowing anything about it. Resp didn't seem so scary, think it was just the complexity of the brain" (D).

> “Neuro teaching was tough as lots of academic book work needed – to understand the brain which is the “most complicated machine ever!” (C)

The students gave the impression that the fact that the brain was complex was common knowledge rather than something they realised once at university.

> “Because the brain’s a fairly complex little structure, isn’t it?!” (O)

> “‘cause the brain is so complicated anyway I think that the basics are maybe quite hard to learn initially but once you've got them it's maybe a bit easier, well, hopefully it'll be easier to start applying the kind of things.” (N)

It was evident that there was a preconception that the brain was complex which was perhaps socially constructed, in addition to the experience of the complexity based on exposure to learning the brain structure and function.

4.3.2 CLINICAL REASONING

Clinical reasoning is the foundation of good clinical practice and this was a process that was perceived to be particularly difficult within neurological physiotherapy. The primary reason given for this by all interviewees was the potentially complex presentation of patients (15/15). The most frequently cited aspect of this was that the patient could be very poorly or in a life threatening state (5). This also echoed comments made in the questionnaire responses. These views were often based on a public perception, for example;

> “Initially sad, because even if you aren’t in the healthcare profession you know the connotations of a stroke, ill health, reduced mobility, you associate it with people dying.” (G)

In addition to the additional pressures this might place on the decisions made by the clinician;

> “Also the seriousness of the condition in Neuro and resp, could be life threatening, they are more well in Msk. There’s more at stake for your decisions in Neuro and Resp” (D).

The students also reflected on the comparison between the subject areas and the impact of their interventions;

> “I think it’s the kind of global aspect of it. I think with musculoskeletal you focus on just one area, so you focus on just a shoulder and also that underlying thing, it could be something we could quite easily treat. But if you are talking about a stroke um, you’re not going to have an impact on the actual cause of whatever’s gone wrong, like you can treat symptoms, so that trying to get to the bottom of it. And also you probably you know a bit more about your neuro patients when you first see them. I suppose also the fact that they are a lot sicker often, well in sense that I saw them in acute neuro.” (B)

The cognitive, perceptual and communication problems were identified as specific impairments that also added to the complexity (8/15). These are impairments that are only seen with patients with brain injury and therefore students would not have encountered these problems necessarily with other areas of physiotherapy. These issues appeared more difficult for the students to articulate and they tended to use more examples to illustrate the point, as seen below;

> “um, you’d have to think more whether they can understand what you’re saying, whether they can actually get the answer across that they want to,

> um you might not know, well for example, the ideomotor and ideo something else, they might know what they want to do but they can't do it, and that um would give you challenges throughout assessing them and treating them. Um, they might stop in the middle of a doorway, so, like how do you get around that. And there will be different challenges that it will present to you" (K)

Often students would attempt to make sense of this again by comparing to other areas of physiotherapy;

> "with MSK it's one part of their body, they've hurt their ankle you sort it out, whereas in neuro it could be anything, it's not just MSK it could be cognitive and things, I think it's just the fact that it's a lot of problems not just one". (J)

The key thing that students identified was that these impairments were in addition to the movement dysfunction that was being treated by the physiotherapist, making the situation more complicated;

> "Could have cognitive problems or communications problems to complicate things further before you even start the treatment." (C)

> "difficult of knowing how to treat someone who is maybe not so aware and you don't know how much aware they are, as in how much do they actually understand." (F)

This also evoked the recall of story narratives to illustrate the complexity and treatment dilemmas through their clinical experiences, examples of this are provided here;

> "you have to be more aware of the patient, in like, how you approach the patient, which side you approach from, do they have neglect, um, you've

sort of gone in much more aware of their background and what's wrong with them. You can't just assume that you ask them and they will tell you the right answer, they might have forgotten or not know, um and it may mean things make more sense. Like on my first placement I didn't have any idea about the anatomy and things, and I had one patient who had a brain tumour on one side and on the other side she had no idea that this was her hand, ur, and obviously first year, first placement you don't know, don't do those sort of things so it made me try to make sense of it. And some people have like a pet name for their hand" (K)

"and if they're not aware of things, do you tell them that they're not aware or, do you pretend it's ok that that they don't know what's going on or, I saw one gentleman who thought his am was a dog and he was convinced his arm was a dog. The physiotherapist never told him that his arm wasn't a dog (giggle), and it's how do you deal with stuff like that" (A)

The above example gives a sense of the awkwardness felt by the student, as the student recalls this event with a nervous giggle. The student did not know the right treatment approach for this presentation, which is seen in this dilemma. This might be an indication that the lack of prescriptive treatment approach adds to the challenge of managing these patients. Another student focuses on the emotional lability of a patient;

"from my experience of people with MS and from a physio point of view, she was quite a heavy MS, she was quite disabled, and along with that comes, again I don't know if it's normal with MS, huge emotional element, she was up one minute and down the next, she could be laughing and crying within the space of a minute. And as a physio you need to be aware of that as

well….because it might not be anything to do with you but she might be screaming and shouting at you for how she feels, she can't do what she wants to do" (M)

This also highlights the anxiety of the student in problem solving how best to deal with these situations in the absence of a specific treatment approach/technique.

In addition to the specific neurological impairments complicating the patient presentation, other issues were identified as adding complexity to the neurological patient presentation. The first of which was the involvement of the whole body (6/15) and secondly the heterogeneity of each patient presenting differently even with similar neurological damage (4/15);

"it's a difficult subject because when you have a broken body part or difficult lungs or anything like that and your brain is functioning well, the person is still kind of there, but once the neuro bit starts to go you lose a bit of the person" (F)

"The thing that stood out was the fact that even if they've had essentially the same thing happen to them or they've had the same diagnosis, just the presentation was so different and you've kind of really gotta be on your toes with what people can and can't do and kind of getting the balance between bringing out the most in people following a like neurological problem, actually accepting when there are limits they can do; it's quite a tricky thing to figure out I think" (N)

"If one bit's affected it affects something else in some people but not in others. Just the fact that it's very different between individuals" (O)

> “you’ve got a very complex situation and the emotional issues, and sort of social element of not being able to do what she wants to do because of the disability and things, it’s quite a big case, its complex and that’s perhaps why neuro is so daunting really” (M)

These examples from students also highlight the importance of potential changes to patient’s personalities (“lose a bit of the person”) which impact the treatment but also connection with their friends and family. There is also a hint to the pressures felt by students knowing how to make realistic goals of treatment and accepting when things may not improve (“accepting when there are limits”). The goal setting process may be more challenging than in other areas of physiotherapy, where the expected outcome might be return to normal function.

Another contributor to the difficulty with neurological clinical reasoning was the treatment approach used. The handling used was perceived to be challenging because it needed to be specific handling (3/15) and it was physically demanding (3/15).

One student recalls;

> “I had a really good educator and she really pushed me and very much about specifics, and not letting me get away with that general approach, um, and the clinical reasoning aspects which I perhaps hadn’t used as much in the previous resp placement because … you just had to do it and there were less techniques to choose from…. It was suddenly taking a step back and really thinking about what I was doing and why. Maybe respiratory is a good example, often the best thing was to get patients up and walk them, and it’s quite tempting to just do that again , but I very much had to

think about why I'm doing things, so how and why are you walking them. What other things are you also doing " (B)

This implies that the student thought that the general approach might be easier, as was the case for the students in OBS3, when actually they just needed support to acknowledge the specificity of the approach. It also appeared that the student felt that you could take either a general or specific approach to the treatment and the senior physiotherapist was using a more specific approach and therefore encouraged this within the student. The novice student may not have initially had the non-propositional knowledge required to have a deep understanding of the presenting problems (Higgs and Titchen 1995) and so the treatment approach could not be specific and tended to be more general. Another student reported how they felt the handling had to be right to get the right outcome, again alluding to the specificity needed;

"fear of the handling having to be right to get the right result" (D)

Along with this need for specific handling is the more physically demanding handling;

"I haven't really enjoyed working with stroke too much in the past because, the people I've worked with have been quite heavy strokes and it's quite hard, it's hard work, it can be really hard work just to get a little bit, and sometimes you don't obviously know how much they are gonna progress, if they are gonna get any better. Yeh, it's a lot diff, it's very different to musculoskeletal, there's a lot more, not always, but at the progressive end of it, they are a lot more reliant on you" (L)

In this example the student appears to be suggesting that the lack of progression can be quite disappointing and the more dependent patients were not as enjoyable to work with. The job satisfaction for this student may come more from being able to improve or cure a patient's condition and this might mean that they are less likely to specialise in an area such as neurology where often the emphasis is on maintenance of a condition or managing the deterioration. This could be strongly linked with the student's perception of disability.

Similarly to OBS1, a frustration shared amongst the interviewees was the lack of a definitive textbook of techniques and no black and white answers (6/15) as adding to the complexity of the decision making during clinical reasoning.

> "that probably contributed to my nervousness, because I like to know the answers, that's probably not the best way to be but, I like to have, to know, if this happens you do this, and it's very much not like that in stroke. I did find it really hard to clinically reason in stroke" (H)

> When asked about treatment techniques in neuro "they're not black and white and I don't like it! Um yeh, not knowing what you should do for each problem is quite, it's quite scary going on placement because you can't go out there and be like ok they're presenting like this, well I could do about 5 or 6 things, it depends what the patient responds to, that will be quite difficult" (K)

This may not be the case for all students, as it appears to be linked to a student's preferred approach to learning, as evidenced below. This could offer another indicator for those students who have a natural (or not) affinity for the subject and ultimately chose to specialise in the area.

> “I think that’s how I learn to have a clear black or white answer, this is how you do it, which is why I find neuro a bit more daunting, it’s not as black and white, you have to think outside the box a bit” (C)

In order to effectively plan treatment you need to be able to predict prognosis (3/15) which was another area of difficulty identified, particularly when prognosis was poor.

> “But it also reminds me that it will be a bit where you might not cure someone, like in msk, nine times out of ten you can get that person doing exactly what they were doing before so it's about being realistic I think, and remembering to be realistic” (G)

> “ I think I expected with neuro, that that would be it and you could try to maintain it but that was it, and I thought that’s going to be a depressing job” (J)

There may be a preconception, as seen above, that neurology is potentially depressing because patients’ do not improve. The following quote could also be suggesting that the course initially reinforces the perception that physiotherapists get people better;

> “Just the likelihood that someone’s going to recover because we’re always – I don’t know, we’re sort of led to assume that people are always going to make a full recover. But you need to know when your treatments aren’t working any more, if you see what I mean, and whether that person is going to get to a certain level and then that’s it. You don’t really know that, and how you’d go about telling someone that’s all they’re going to get. That’s quite hard from what I’ve experienced, telling someone that their arm is not

> going to move and the fact that - . Someone said that he heard the door bang and his arm moved and he got all excited about that, and how to tell him that that was just a reaction." (O)

These comments (above and below) highlight that communicating the predicted prognosis to patients and their families is an additional concern for students and something they do not feel experienced enough to deal with.

> "from what I've seen there are some very difficult conversations to be had with stroke patients and the challenges where families can be very upset, and it's one of the areas where we deal with patients that acutely. There's not many areas where we are with them from the beginning when something so huge has happened, and then how you deal with all of that as well." (D)

It was also highlighted that being unable to fix the brain (2/15) was an added pressure during clinical reasoning.

> "It's not like we can fix the brain. So I'm not quite sure what we actually do. So it's gonna be interesting to find out". (F)

These quotes highlight that students have the perception that the physiotherapy role is to cure rather than care, and frustrations appear when this is not possible. This is one of the learning patterns identified by Lindquist et al (2010), learning to cure, and this may represent their stage of development.

The ability to recognise and utilise transferable skills (11/15) could be another aspect influenced by the stage of development of the students. There was some controversy uncovered, but the students were often not aware of the transferability

of skills until after the placement experience (5/15), and many students earlier in the course found it difficult to see the transferability (4/15).

> "I don't think you realise until you go on placement, so actually what I learned from there goes across. When you're doing it you are very focused that this is musculoskeletal and you don't tend to think of the wider, probably because you don't have the experience. I think when you don't know something or you're not aware of something then you're more apprehensive about what it is so it's not until you actually go out and working in these areas that you realise the principles are the same" (D)

This interviewee is also recognising the power of experiential learning, which confers that recognising transferability, may not be possible until the opportunities arise to experience it, or reflect upon the experiences, as these students' illustrate;

> "with hindsight I can see a lot of my musculoskeletal forms a basis for my neurology things and like almost more and more the movement science things, it's very important that you've got optimum biomechanical situation to work from and it's less important the tonal aspects and the bobath neurodevelopmental thing, which is what I was really interested in to start with but actually I can see that by knowing how to strengthen and stretch and relieve pain you can really apply that" (B)

> "Once you break it all down you can draw on what you already know e.g. sit to stand ortho, shoulder sublux Msk." (C)

> "Now coming to end of course I've learnt not to block neuro, msk etc as all PT skills can be transferred." (C)

The importance of the placement experience in consolidating transferable skills underpins all of the above quotes. As a neurology lecturer, I need to ask the question that perhaps transferability of practical skills cannot be taught until all the teaching and placement experience has been completed.

4.3.3 IMPORTANCE OF THE NEUROLOGICAL PHYSIOTHERAPIST ROLE

Importance of the neurological physiotherapist role was pointed out to be significant above other areas of physiotherapy. It was perceived that there were high expectations from the patient and their family (4/15);

> “there are very upset, demanding patients to deal with and we start involvement very acutely so this can be quite challenging.” (D)

This added to the perception by students that the outcome of neurological interventions have the biggest impact on patients and families lives (6/15) and that they would build close relationships with the patient and family (4/15).

> “Neurology is one of the areas that has the biggest impact on a patient’s life. Huge upheaval even in paeds. Their whole life and their families’ changes. You are part of their whole life, a pillar of support as well as the PT.” (D)

> “can make such a huge difference to someone by doing quite minor things for them” (G)

It is sometimes the opportunity to build these therapeutic relationships that adds to the enjoyment of therapists working in neurology and could be another indicator of potential long term special interest in the area. This student illustrates this satisfaction;

> “I think the bit about physio that I love is the relationship, that you build such a good relationship with your patients because you’re with them for such a long time, every day, and you’re making a difference and they are grateful for it. That was really important, I really enjoyed that” (M)

Those students that recognised the importance of the relationship with patients are potentially more likely to enjoy working within neurological physiotherapy settings. The relationship achieved with patients has been linked with improved treatment outcomes. In order to achieve a successful relationship a number of characteristics need to be addressed some of which, for example expectations, trust and empathy are illustrated in the quotes above. Besley et al (2010) demonstrated how multi-faceted the therapist-patient relationship can be and identified 8 key themes with 32 subcategories when reviewing the available literature regarding the ‘therapeutic relationship’. This complex interaction could impact on the types of relationships therapists’ develop in different areas of physiotherapy.

These pressures married with the sympathy felt (3/15) for these patients means that students have a great deal of emotional stress to deal with (4/10) and some students appear better prepared to manage this than others;

> “Initially I found it difficult emotionally as I considered the impact the stroke had on them and their families. I was able to empathise but it was sad, I just thought right let’s try to help”. (A)

> “There is the impact on the PT, not sure I could do this as a person, cope with everything emotionally that goes with it.” (D)

4.3.4 NEUROLOGICAL PHYSIOTHERAPY TEACHING AND LEARNING EXPERIENCE

The influences on the teaching and learning experience for neurological physiotherapy students were also discussed. Most of the interviewees highlighted unprompted how important the placement experiences were in learning (10/15) as an opportunity to integrate the knowledge and to observe and practise on real patients. This reinforces the argument for experiential learning and is a theme that has run throughout the data collected. Students' identify best with the practice placement experiences because they get to experience what they are training to be able to do.

> "for me it only really made sense when I went on placement, for me, I don't learn by reading books, my brain doesn't function that way" (M)

> "practically placement is always really good because you are dealing with real people and you have to find out what is the matter with them and if it's something that you haven't come across before you have to learn about it appropriate to your treatment." (G)

> "I think when you go on placement everything changes, you see it a different way, so I'm really looking forward to that" (J)

It appeared from the comments of some students that the expectation of the university- based teaching and the practice placement experience were the same which left them disappointed with what they had learned in university, in comparison to the learning on placement;

> "I go on placements to learn what I thought I should learn at uni ……I felt that I learned a lot more on placement than I did in lectures because a

lot of our case studies were really specific as in they had a very specific condition or there were really really not well or lots of things were wrong." (F)

"It was difficult before placement to make the above links but easy on placement- links much easier because you have background notes, scans and having the patient to see it happening helps". (A)

The practice placement experience should be the opportunity to practise with patients and to consolidate the knowledge and skills learned in university, which some students appreciated;

"It's much easier to understand once you've seen it on a patient, so I think once we all come back from our neurology placements, we'll be like, why was it so hard?" (K)

It is during the interaction with patients that students begin to develop areas of interest which they may pursue in their qualified careers;

"the placement in stroke was really, was what made it, this is worth it, this is really interesting, I enjoy it." (M)

The importance of the role of placement is unchallenged. The focus of this research has to be how best to prepare students in university to be receptive to effective learning on placement. These student comments beg the question, do students need to be better informed about the expectations of the university based teaching and the practice placement experiences. This would ensure students' are clear about the different learning experiences.

There were a number of comments about the structure of the teaching (8/15) many of which were expressing controversy about the usefulness of the EBL

process (5/15). Some students felt it was a great opportunity for independent study, whereas others felt it resulted in a very narrow knowledge base as they only focused on researching their own learning objective.

> “Using EBL to suggest pathology and then go from there keeps it very real. But it's kind of a flip you can be very lazy when you do learning with EBL because other people do it for you, sometimes it's hard to motivate yourself to read nine of the power points or however many hand-outs you just rip them off and put them in your folder you don’t really learn them though.” (G)

> “EBL case studies, where they’ve got everything in the world wrong with them, but how often do you see someone with every single psycho-social and physical issue wrong with them? It just feels a bit - . Well they could relate it more to what you see in practice. I’m not saying that you wouldn’t see someone like that, but just to make it a bit more real for everybody, we might take it a bit more seriously.” (O)

There were also many issues discussed that related to the limited amount of time dedicated to the neurology learning. Similarly to that also identified in the questionnaire responses and background medical literature (Ridsdale et al 2007);

> “I think my decreased confidence in Neuro and Resp was due to teaching structure….the hours for Resp and Neuro were very limited.” (D)

> “Respiratory and Neuro are short blocks of teaching which are so easily forgotten, if they were spread out it would have to keep thinking about it.” (A)

> “Blocks of teaching good but you get into the mindset of seeing them as different and switching off. But to do them altogether might be confusing. More time during transition to look at the overlap would be good.” (C)

There appears to be two issues highlighted here; the amount of time dedicated to each area and how it is structured to allow assimilation of knowledge and transferability of knowledge and skills.

The suggestions for improvements to teaching (10/15) to decrease the anxiety of learning neurology and to facilitate the learning were varied but resonated with those in the questionnaire responses, including more time between teaching sessions; use of interactive methods; and involving more patients. There was also a sense that the anticipation of learning neurology was worse than the actual experience, suggesting that there might be a preconception that needs to also be explored.

> “You could make it clearer to first years that neuro is not so scary and complex as they think it is” (C)

> “certainly a lot of reassurance is it`s not going to be as bad as it looks in the book.” (E)

Although this view was not universal as one student felt they had been reassured and any preconceptions broken down;

> “I think just, really like, everyone has been really good to make it quite nice and been really reassuring, but not as bad as its made out to be. I think that`s really helped. I`m quite happy I guess.”(E)

The suggestions for improvements to the teaching capitalised on different learning styles e.g. using brain models to address kinaesthetic needs of learners (3/15), and greater use of videos for the visual needs of learners (3/15).

> "Using more videos would have made it more real to observe clinical presentations as a visual learner." (A)

One student makes the comparison to kinaesthetic learning in other areas of physiotherapy;

> "with the muscles we played with each other. We felt all the points and drew in respiratory, where the lungs are and the pleura. We draw on ourselves so you could see how it was sitting, but with the brain you can't really open each other's brain, but maybe we could have access to those brain models to play with." (F)

It is interesting that the kinaesthetic and visual needs were specifically identified by the students in relation to learning neurological physiotherapy. Physiotherapists' particularly neurological physiotherapists' will utilise very specific observations and handling skills and therefore perhaps the teaching methods should focus on these methods to reflect the specific skills required. The title 'physical therapists' emphasises this kinaesthetic, physical approach.

The need for an integrated teaching approach (2/15) to aid clinical reasoning was discussed, and the use of real patients in teaching (4/15) was consistently praised.

> "I think if we would have had it integrated from the very beginning there wouldn't be the fear factor there it would just be normal for us" (G)

> “I really liked having the patients in, so having them in to hear their experiences, this is what a Parkinson’s patient looks like, this is what someone else looks like” (M)

One student recalls an example where I had tried to integrate the neurological consideration into the year one teaching;

> “one comment you made in the elbow seminar, um (giggle) it always stuck in my mind, you said like, are there any questions about the nerves, cause no one ever went into the nerves much, and you were like, in the second year everyone always finds the nerves quite hard. So it stuck in my mind that I need to try to do the nerves, and when you look back on your first year teaching, it is drummed into you all the time where the bones, where the muscle attachments are, never ever is it, this nerve is placed in between these muscles. And that’s something I think first years should have more of. In the lead lectures the nerves get a PowerPoint slide at the end, saying this is the median nerve etc, doesn’t say what they are, doesn’t say what they innervate. I think we would have been more aware of things in second year if that had been emphasised more in first year” (K)

This is also a clear example of the relationship I have with the students and how I am part of the case being studied, as a lecturer and a researcher. This example does suggest that students felt able to discuss experiences openly in my company. Although. this is a positive experience rather than a negative one which might be more difficult for the students to discuss openly.

The integrated approach to teaching is always the intention, although it appears this may not always be successful or consistent from all lecturers. This will adversely affect students in preparation for clinical placement experience.

4.3.5 INFLUENCES ON STUDENTS' PERCEPTIONS OF NEUROLOGY.

The Influences on students' perceptions of neurology was an aspect which attracted much more discussion than I had anticipated. The most frequently cited influence was their peers (5/15) once they had started the course, in their own cohort and previous cohorts.

> "Yes, because I think it is often said that neurology is a quite tough subject to grasp and I think that goes bounding around amongst our peers a lot and things you generally read it`s quite a subject of grasp. So I think that was why. The panic stemmed from that probably." (E)

There was a recognisable preference for MSK, and not neurology, noted by some students;

> "lot of people in our cohort had done sports sciences and then that was definitely their interest" (B)

This peer influence could plant negative thoughts about neurology. Although occasionally students had a different emotional response to this situation;

> "I think because other people find it scary I'm determined to give it a go! [laughter]."(O)

Many students felt the fear began before they started the course. It was felt that the news and societal views fed into the public perception of the complexity of the brain (3/15). One student sums this up nicely when responding to the question; where did you get the perception that brains were complex?;

> "I don't know it could be news, it could be um, talking to family, friends, anybody really, I don't know where it's come from. Um, just an assumption I

> think of, um maybe things on the news when they talk about doctors and you know the neuro side of things and you think oh gosh that's complicated, that's difficult. I think it is a society thing…at school it wasn't made to be any more tricky than anything else, it was just another subject, or part of a subject. So maybe it is just the general assumptions of the public. " (M)

The lack of personal and work experiences of people with neurological conditions (2/15) was also seen as a significant influence;

> "I went on the wards for a bit, I observed my mum, she does women's health, but not too much because I've been quite involved with physio from a young age cause my mum was one. I didn't do too much on the ward experience, um and it wasn't actually until I came here that I knew that neuro was like a massive part of physio, and I think Martin was like, did you really not know that! (giggle)" (K)

Another student gave qualified physiotherapists as examples of potential influences on preconceptions of areas of physiotherapy;

> " when I was researching all the physiotherapy, I really liked sports at the time, completely. And I remember the physio I spoke to then were all like ok, well you've got neuro and respiratory as well that they want people to be interested in because that's what they want physios in as not so many do that. And they were like, I think their opinions were impressed upon me. We don't particularly like it we prefer the sport but you have to do neuro and you just get it over and done with and go into sport eventually" (J)

This situation could be very powerful, particularly as these are therapists the student aspires to expressing this bias.

In contrast areas like musculoskeletal were much more familiar to students (4/15), through public awareness, previous study, personal experiences and work experience.

> “Everybody knows physios in musculoskeletal, but not so much in respiratory paediatrics and neurology” (F)

> “My view of PT was out-patients as I had no experience or research of other areas. I arrived here then found out about the other core areas” (C)

If this is the general perception of physiotherapy, then this will be what the students were initially attracted to as a career aspiration.

> “initially I didn’t really know anything about neuro and respiratory, I sort of knew vaguely but wasn’t very aware, didn’t know exactly what we could do and why. And physio is, musculoskeletal is more obvious. The perceptions of a physio in the public is more towards that side” (M)

Public perceptions of physiotherapy will be partly responsible for the students’ perceptions of physiotherapy and therefore neurological physiotherapy that they arrive at the university with. This could mean that any preference for area of physiotherapy or neurophobia could be well established before the start of the course and might need addressing from day one. There is a risk that these perceptions are reinforced early in the programme before attempting to break those down later in the programme.

4.3.6 CONCLUSION OF INTERVIEW FINDINGS

In these interview findings the inductive emergent themes from the data (as seen previously in figure 4) were identified as;

- Difficulty conceptualising neurological knowledge
- Increased complexity of neurological clinical reasoning
- Teaching and learning neurological physiotherapy
- Perceived importance of neurological PT role
- Influences on students' perceptions of neurology.

These five key themes can be used to discuss the research questions;

What are students' perceptions of the area of neurology?

- Influences on students' perceptions of neurology.

  These influences included peers, experiences of people with neurological conditions, clinicians, and public perceptions.

- Perceived importance of neurological PT role

  There was a perceived high expectation from patients and their families. Physiotherapy management was also perceived to have an important impact on the patient's quality of life.

What are the students' experiences of the university based learning of neurological physiotherapy?

- Difficulty conceptualising neurological knowledge.

  The difficulty conceptualising neurology knowledge was explained by the hidden nature and complexity of the information. It was also due to the unfamiliarity of the topic and lack of prior knowledge.

- Increased complexity of neurological clinical reasoning.

This was explained by the complex neurological patient presentation which may include the whole body and influential cognitive, perceptual and communication problems. The treatment was also highlighted as a challenge to learn as there was a lack of a definitive answer.

- Teaching and learning neurological physiotherapy.

  The influences on this experience were linked to the pedagogy and the learning needs of the students.

4.4 CASE STUDY THEMES

The interviews provided the bulk of findings for this study. To ensure that all the valuable data collected from all methods was accounted for, rather than adopting the interview themes as the final discussion themes, I conducted a merge of the data analysis of the findings from each of the 3 data collection methods to determine the discussion themes to be used in Chapter 5 to answer the research questions. The summary of findings from the three data collection methods can be seen in the following pages in Table 11.These have then been categorised into themes as seen in Table 12. The discussion under these themes will be used to answer the research questions in Chapter 5

Questionnaires	Observations	Interviews
It is apparent that the confidence and knowledge of an area are potentially linked to the enjoyment of the subject more so than the difficulty. One year 3 BSc student sums this up when stating; "Neurology and CVR are the two areas of physio that I enjoy most, therefore I feel more confident in these areas, which makes me feel that my knowledge in these areas is better". These findings also overwhelmingly suggest that the practice placement experiences are the most important environment to learn and consolidate knowledge and clinical reasoning. The additional key findings in relation to students' experiences of learning neurology which influenced the interviews conducted and could potentially help sculpt the teaching of neurological physiotherapy are; Neurology knowledge is influenced by the amount of teaching and experience a student has had, both	There were a number of key issues that emerged from my teaching and observations; • Students behaviour is very similar in neurological theory sessions to sessions from other topics • Students find the role play of assessment and treatment of neurological patients very difficult • The students struggled to see that they had learned the assessment/ technique unless they had the opportunity to observe specific example, copy	The presence of neurophobia was difficult to discern because many of the students acknowledged being daunted by the complexity of neurology, rather than fearing it. Many said they were interested whilst daunted, so this type of fear is not accompanied with a negative effect on their interest and motivation. It was evident that the emotional response to this complexity affected some students, as they acknowledged that they lost interest because it was too complex. In contrast, occasionally students said neurology is not difficult and that they had equal knowledge in all areas, and were equally interested in all areas. Students were often able to identify the reason for their fear of neurology if they experienced it, such as fear of the unknown, the pathologies were scary, but some expressed that they were unclear where the fear had originated from. There was an overwhelming sense that it was difficult to conceptualise neurological knowledge. This was because students were being asked to do something new, in that they had to learn about things they could not see or feel, the hidden nature of the structures, physiology and causes of symptoms was key to this difficulty. For many students it was significant that the neurological anatomy, physiology, pathology and treatment was all new, this included new knowledge and new terminology/language. Another issue highlighted by students that contributed to the difficulty with learning neurological physiotherapy was the complexity of the brain, actual and perceived. Clinical reasoning is the foundation of good clinical practice and this was a process that was perceived to be particularly difficult within neurological physiotherapy. The primary reason given for this by all interviewees was the potentially complex presentation of patients. The most frequently cited aspects of this were; the patient could be very poorly or life threatening, the cognitive and perceptual problems adding to complexity, Complexity due to the whole body involvement, and the

professionally and personally. • Neurology is considered difficult but many students recognise that all areas have difficult elements • There is a spread of level of interest in neurology. Students are still interested in neurology even if it is considered the most difficult. Their interest is influenced by their previous experiences. • Student's confidence in managing neurological patients is influenced by their level of interest and the amount of teaching and practice placement experience they have received. • There have been a number of additional reasons for the difficulty in learning neurology identified ranging from the process of integrating knowledge and clinically reasoning patient presentations to the new terminology medical instability of patients and lack of definitive treatment approaches. This highlights that this is a multi-faceted problem warranting further investigation. • The diverse suggestions for	and practice in context. • Students wanted to know specifically which techniques to use for each problem and when this didn't happen it caused some anxiety. • The intense short block of teaching left some students feeling anxious that they had not had enough time to learn all they needed to in preparation for placement. • Some students were quick to be dismissive of the use of normal movement as a treatment technique, as they felt this was too easy/general	fact that every patient presents differently. Another contributor to the difficulty with neurological clinical reasoning was the treatment approach used. The handling used was perceived to be challenging because it needed to be specific handling and it was physically demanding. A frustration shared amongst the interviewees was the lack of a definitive textbook of techniques and no black and white answers as adding to the complexity of the clinical reasoning. In order to effectively plan treatment you need to be able to predict prognosis which was another area of difficulty particularly when prognosis was poor. It was highlighted that being unable to fix the brain was an added pressure during clinical reasoning. The recognition of the transferable skills learned was another significant area of controversy, highlighting that students are often not aware of the transferability of skills until after the placement experience, and many students earlier in the course found it difficult to see the transferability. Importance of the neurological PT role was pointed out to be significant above other areas of physiotherapy. It was perceived that there were high expectations from patient and family which added to the perception by students that the outcome of neurological interventions has biggest impact of patients and families lives and that they would build close relationship with patient and family. These pressures married with the sympathy felt for these patients' means that students have a great deal of emotional stress to deal with. The influences on the teaching and learning experience for neurological physiotherapy students were also discussed. Most of the interviewees highlighted unprompted how important the placement experiences were in learning as an opportunity to integrate the knowledge and to observe and practise on real patients. There were a number of comments about the structure of the teaching although many of these were expressing controversy about the usefulness of the EBL process. The suggestions for improvements to teaching were varied, they capitalised on learning

improvements to the teaching to facilitate students to overcome the difficulties of learning neurology included strategies to involve more real life situations that would develop the real life clinical reasoning, integration and transfer of knowledge required to effectively treat patients. There were also strategies suggested that would capitalise on students' differing learning styles.	and that the more specific techniques in musculoskeletal were superior. • The use of patients in teaching put all the teaching into perspective and students acknowledged the challenges of teaching neurological physiotherapy on normals (each other).	styles e.g. using brain models for kinaesthetic learners, and greater use of videos for visual learners. The need for an integrated teaching approach to aid clinical reasoning was discussed, and the use of real patients in teaching was praised. The Influences on students' perceptions of neurology was an aspect which attracted much more discussion than I had anticipated. The most frequently cited influence was their peers once they had started the course, in their own cohort and previous cohorts. Many students felt the fear began before they started the course. It was felt that the news and society fed into the public perception of the complexity of the brain. and their lack of personal and work experiences with neurological conditions. In contrast areas like musculoskeletal were much more familiar to students, through public awareness, previous study, personal experiences and work experience.

Table 11. Summary of findings from each data collection method as discussed above.

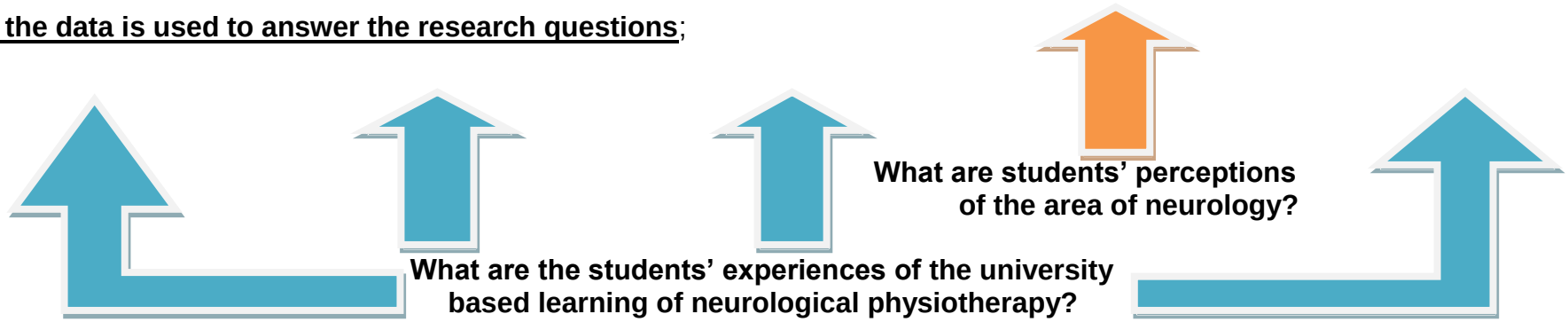
The colours used highlight where the merged findings have been distilled into the 5 emergent themes for further discussion. This has been presented in this manner in an attempt to achieve greater transparency.

The following discussion themes have been derived from the categories identified in the merged analysis and triangulation of data from the 3 collection methods above. The discussion of this process and how this will be used to answer the research questions is in the main text.

Neurology Knowledge	Treatment Approach	Clinical Reasoning	Values and Beliefs	Pedagogy
• Conceptual difficulty as structures and functions hidden and complex/abstract • Neurology knowledge is new and unfamiliar • Level of interest is the key rather than difficulty as all areas have difficult elements	• Students struggle without a specific set of evidence based techniques • Students ability to recognise and use transferable skills	• Need to integrate knowledge to clinically reason • Placement opportunities seen as most important for learning	• Perceptions of neurology start prior to and at the start of the course • Perceived importance of the neurological PT role and the associated emotional issues	• Individuals learning needs need to be addressed in the teaching • The time and amount of teaching and personal experiences in neurology influences perceived knowledge and confidence • Difficulty in learning on normal in role play – need to see patients

Table 12. Emergent discussion themes.

How the data is used to answer the research questions;



4.5 IDENTIFYING THE THEMES

Table 11 represents the conclusions from the three data collection methods (questionnaire, observation and interview) and Table 12 demonstrates graphically how the 5 themes were informed by the merged analysis of the findings from the three data collection methods. The remaining 5 sections in this chapter (4.5.1 – 4.5.5.) summarises how each of the themes emerged, using examples from the three data collection findings.

4.5.1 NEUROLOGY KNOWLEDGE

The difficulty conceptualising neurological information was key throughout all of the data collected. In the questionnaire data neurology was perceived as the most difficult subject and the area that students had the least knowledge. The reasons given for this included the complexity of the neuroanatomy, neurophysiology, and neuropathologies. A key issue noted by students in the comments was the negative influence of their lack of previous knowledge or experience with neurological patients. During the observations, many of the behaviours observed reinforced these issues. Students were seen to ask lots of questions during sessions in an attempt to understand the information presented and the more confident students were those who had previous knowledge and experience of the subject. The interviews allowed a greater depth of exploration of these issues and identified a number of reasons for this difficulty in conceptualising neurology knowledge. Primarily it was the hidden nature of the structures and functions that made the anatomy, physiology and pathology so challenging to learn. The lack of previous neurology learning was also significant, as many students described how all the knowledge and terminology was new and unfamiliar and likened this to

learning a new language. Although throughout all the data collect there was a strong sense that students accepted that neurology was difficult to learn and therefore it was their level of interest in the subject that determined their engagement. The complexity of the way patients presented with neurological pathologies was a large source of anxiety for students and highlights the link between the understanding of the presentation and being able to provide the appropriate treatment which will be discussed under the clinical reasoning theme. The numbers of potential problems and the effects on the whole body, along with the heterogeneity of patients and the potential ill health of the patients all influenced this anxiety.

4.5.2 TREATMENT APPROACH

The second theme was the **treatment approach**. In the questionnaire data, the respondents discussed the complexity of the treatment approach as a contributor to the difficulty in learning neurology and elaborated on this in the additional comments asking for more opportunities to integrate the neurology and musculoskeletal learning. The students surveyed felt least confident in treating cardiovascular and respiratory patients rather than neurological which implies that although the treatment approach is perceived to be complex to learn this does not affect the students confidence treating patients as much as other areas of physiotherapy. During my observations, particularly within the practical sessions, a major frustration for students was evident as the students searched for and requested the answers to the clinical problems in the form of prescriptive techniques, in order to imitate. This was a familiar approach to learning physiotherapy skills from their musculoskeletal teaching, but this is not an approach within neurological physiotherapy teaching specifically. There was also a

sense from some students that the lack of specific techniques meant the approach was inferior and the use of normal movement to rehabilitate movement dysfunction was a general approach and therefore simpler. The interview data revealed that some students did indeed feel the approach to treating neurological patients was very functional and therefore more straight forwards. However there was some controversy whether this functional movement approach was used too simplistically and the specificity of movement was the ultimate goal which was a much more demanding approach. Often the specificity of analysing movement was not achieved by the student without the intervention and education from the practice educator on placement. It was strongly evident again that the lack of black and white treatment answers was a frustration and that there were a number of new presentations that influenced the treatment to contend with, such as communication and cognitive problems.

4.5.3 CLINICAL REASONING

A further theme to emerge that focuses on the integration of all the knowledge and skills as described above is **clinical reasoning**. This was not a process which was asked about specifically in the questions although it may have been considered within the ‘confidence in treatment’ question. It also emerged as an issue in the additional comments as some students noted how you cannot make sense of the knowledge required and the treatment approaches used until they had some experience with patients. This led to suggestions for patients to be used within the teaching. It is the interaction with patients that is essential to perform the clinical decision making required in clinical reasoning which is why this develops exponentially on placement. The observations were another opportunity to observe how difficult it is for students to learn neurological clinical reasoning

without the presence of a patient. Those who could begin to clinically reason were those who had previous experience working with people with neurological conditions. More often the observations in the practical sessions highlighted that students had some knowledge and some clinical skills but were unable to reason how to apply these to a neurological case. This resulted in an awkwardness which was observed as silences giggles, as students struggled to role play, often unsuccessfully, the patient case scenario. The interview data confirmed that students valued most the practice placement experiences when learning neurological clinical reasoning. The transferability of skills that is encouraged within the university teaching is not realised fully until after the placement experiences. There were also some frustrations expressed by students about the expectations of the university based teaching and how they did not learn what they expected to learn until they had completed their placement experiences.

4.5.4 VALUES AND BELIEFS

It was clear that the students' **values and beliefs** influenced their ability to learn neurological physiotherapy and their interest and motivation for the subject. In the questionnaires, students were not questioned specifically about their beliefs about neurology although some of this information is implicit in the comments noted. One student had the perception that stroke patients heal themselves and possibly would not then behold the belief that physiotherapy had a role in stroke management. Some of the students that had experienced working with people with neurological conditions noted that this was the reason they joined the course and were so interested in the subject. Whereas other students noted that they were passionate about other areas of physiotherapy, predominantly musculoskeletal. In the observations there was a perception from the students that all physiotherapy

teaching would use a similar approach and that there would be specific techniques which could be taught for each presenting problem. The observation made during the patient session was the most telling that students had not necessarily considered the level of disability that patients may be experiencing or know how to act around people with this level of disability. The students appeared very awkward initially when the patient arrived in my electric wheelchair. It is difficult to interpret what the students' beliefs about disability were but it was clear that this was a difficult social situation for them to be placed in initially.

4.5.5 PEDAGOGY

The questionnaire respondents identified issues related to the **pedagogy** through suggestions for improvements to the teaching to overcome difficulties they had experienced. The key issues highlighted were the requests for teaching that suited the individual learning needs and preferences of the students and the use of patients within the university based teaching. The observation data revealed further issues related to the pedagogy/andragogy. In particular students' found the role play requirements challenging when learning the neurological physiotherapy skills. The students' also had an expectation that the interventions would be taught in a didactic way rather than a problem solving approach. All of these issues were also apparent within the interviews, with the addition of an emphasis on the amount of time required to learn and understand the information.

5.0 DISCUSSION OF FINDINGS - ANSWERING THE RESEARCH QUESTIONS

This Chapter will firstly discuss the potential interaction of the emergent themes in describing the process of learning neurological physiotherapy (section 5.1) The remainder of the chapter will address each of the research questions in the light of the findings from the study (Sections 5.2-5.5)

5.1 HOW THE EMERGENT THEMES DESCRIBE THE LEARNING EXPERIENCE

Figure 5, below, represents how the emergent themes (in bold) from this research interact to represent the students' experience of learning neurological physiotherapy.

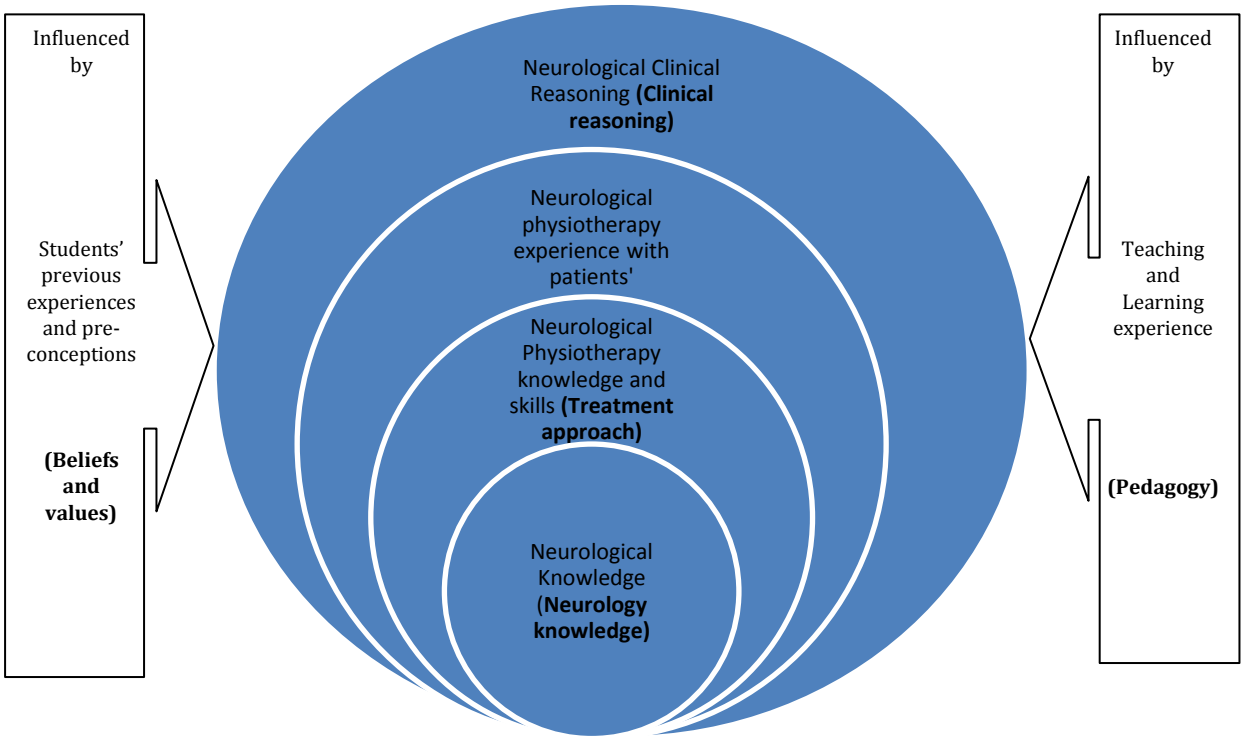


Figure 5. How the themes influence the learning of neurological clinical reasoning.

The diagram illustrates the potential disruption to students' ability to learn neurological physiotherapy clinical reasoning if there are challenges in learning within any of the other themes areas. It also illustrates that students are unable to clinically reason effectively until they have gained experiential learning during practice placement. The key influences in this process of learning are the student's beliefs, values and pre-conceptions, in addition to the teaching and learning experience offered.

The themes identified through the data analysis provide some answers to the research questions posed. The students' perceptions of neurology were explored within the 'values and beliefs' theme. Whereas the key emergent themes which help to describe the students experience of learning neurological physiotherapy within university were the 'neurology knowledge', 'treatment approach', 'clinical reasoning', and 'pedagogy'. In essence the students' discussed the challenges of learning the neurology knowledge and understanding the treatment approach in order to be able to clinically reason this information when treating patients. This process is influenced by the 'pedagogical methods' within university, as well as the student's 'values and beliefs'. The significant omission during the university based teaching is the lack of experiential learning with patients which limits the students' ability to learn the clinical reasoning, prior to going into their placement.

Each of the research questions will now be answered in turn using the findings of the research.

5.2 WHAT ARE STUDENTS' PERCEPTIONS OF THE AREA OF NEUROLOGY?

The first research question to be answered is concerned with what students' perceptions of neurology might be. The biggest influence on students' initial perceptions of neurology as a specialist area appeared to be moulded from their previous experiences. These experiences included any contact with people with neurological conditions but also their preconceptions of neurology and disability which had been influenced by the media, family and other interactions. The students who had previous experience of neurological conditions had a more positive view of disability, were more excited to learn neurological physiotherapy and were less daunted then those who had no experience of neurology. Students' perceptions of the role of the neurological physiotherapist were also influenced by the perception of neurology and disability. This perception appeared to change over time through experience of neurological physiotherapy and the influence of others. Students often perceived that the physiotherapy role was pivotal in the patient management and felt there was great pressure on them to achieve patient and families' expectations. Many of the students also felt an emotional pressure, as they had great sympathy for the patients.

The emergent theme 'Societal values and beliefs' provides some answers to students' perceptions of neurology and will be discussed below.

5.2.1 SOCIETAL VALUES AND BELIEFS

There are numerous examples in the students comments that suggest the public perception of physiotherapy, neurology, and neurological disability had influenced

their interest and prior knowledge of neurological physiotherapy. In turn this may also have influenced their susceptibility to neurophobia.

The public perception of physiotherapy has improved according to a regular survey conducted by the CSP (2012). In this survey the treatment of musculoskeletal problems and sporting injuries was the most well-known, but respondents were also aware of the physiotherapy role in rehabilitation, stroke, and heart conditions. The survey demonstrated 52% of the public in the survey being aware that physiotherapists treat long term health conditions and 61% recognising stroke management. This does suggest a good level of awareness of neurological physiotherapy, even if the areas are defined by the condition rather than the field of neurology. If the students joining the physiotherapy courses are representative of this public perception then they should have a reasonable awareness of the role of physiotherapy for neurological conditions. Furthermore, ideally students applying for the course will have researched the profession and considered all the areas in which physiotherapists work although this was not always the case;

> "My view of PT was out-patients as I had no experience or research of other areas. I arrived here then found out about the other core areas!" (C).

This lack of awareness could lead to the student having limited interest in the subject which could in turn negatively affect their level of motivation and engagement with the subject. It might also present as fear of the unknown (neurophobia). Alternatively as seen in previous examples it might just inspire interest and motivation to explore this new area of practice. Each of these responses will be individual to the student and examples of all of these were encountered throughout the research.

The students commence on the course with individual beliefs about disability which will have been influenced by the society that they have been socialised into. These beliefs will potentially influence their interest and enjoyment working in neurology which involves differing levels of disability associated with the long term conditions. Many of the students identified the characteristics of long term conditions as a source of potential anxiety;

> "I think I expected with neuro, that that would be it and you could try to maintain it but that was it, and I thought that's going to be a depressing job, but he was really enthusiastic about how his patients were changing" (J)

This student is recalling hearing from another student about his neurology placement experiences and comparing this to her expectations having not experienced neurology and having a specific interest in Msk, namely military rehabilitation. Her preconceptions were that all neurological patients were palliative, although she was unable to articulate where this perception had been conceived.

The emotional response to neurological patients was varied with some students finding it difficult to cope with. Often there was an initial uneasiness as seen in the example of OBS 4 where the students were shocked by the patient's presentation, although this was quickly rectified. Another student commented;

> "Initially found it difficult emotionally as I considered the impact the stroke had on them and their families. I was able to empathise but it was sad, I just thought right let's try to help". (A)

The emotional involvement was also a key element in the role for the physiotherapist as the students often expressed their sorrow for the neurological

patients. This sorrow could be linked to the social stigma attached to chronic illness in society (Jacoby et al 2005). Many neurological conditions would be classified as chronic stigmatising conditions because they experience symptoms that are difficult for others to understand, the illness can become central to their identity and the social consequences are persistent (Jacoby et al 2005). The stigma is linked to the disability rather than the condition (WHO 2006). One student highlights how making changes to the environment to facilitate and enable a patient to function within society was a rewarding experience.

> "It's the subtle differences that you can make which can change their life, really, you could get them to be able to write a letter to their daughter or whatever, and stuff like that I find really interesting"(J)

Potentially it is the students who demonstrate this empathetic approach to disability that will most enjoy neurology and who will be less likely to experience neurophobia. However it was discussed in the literature review that of the health profession students surveyed, physiotherapists had the most negative attitude of disability on admission to the course (Stachura & Garven 2003) and these views remain less positive than Occupational Therapy students at the end of the course (Stachura & Garven 2003). The views did improve by the end of the course, and this may be one justification for learning neurology part way through the course rather than in the beginning. Alternatively these views could be challenged in the beginning of the course and appropriate training in disability provided.

The life changing nature of a neurological condition was highlighted by the students as an aspect of neurology which added pressure to the role of the neurological physiotherapist. This can be linked to the stigma attached by the society we live in. In that the disability associated with neurological conditions has

negative connotations. Physiotherapists who work in neurology therefore will not gain satisfaction from curing the person as they might do in other areas of physiotherapy but through improving the quality of life of the person.

> “Neurology is one of the areas that has the biggest impact on a patient’s life, huge upheaval even in paeds. Their whole life and their families changes. You are part of their whole life, a pillar of support as well as the PT”. (A)

This student highlighted the demands both professionally and personally when working within neurology.

The importance of the physiotherapy role in improving disability is also discussed. This expectation is seen as an additional pressure for the student.

> “stroke is obviously an area that we actually make more of a difference than anybody, um, because with stroke specifically, there are drugs that can be prescribed, there are things that the doctors can do but, they can’t reverse what’s happened and they don’t have the time or specific knowledge to be able to sit there for a couple of hours and sort of work with the patient, in the way that we do to get back the movement, the strength that they had before. And the sort of the plasticity the changes, that side they can’t do anything about, so yes they can prescribe drugs but actually the biggest part of a stroke patients recovery is physio” (M)

This student demonstrates good knowledge to recognise potential for recovery following stroke and identifies the importance of regaining movement and function.

The pressure students feel and the responsibility for neurological patients could be as a result of their personality or their experiences with neurological patients, but it

is likely to also be produced by the society we live in. The negative connotations of disability result in students wanting to ‘cure’ or make the patients better and failure to do so is too much of an emotional burden for some students.

5.3 DO STUDENTS EXPERIENCE SYMPTOMS OF NEUROPHOBIA IN A SIMILAR WAY TO MEDICAL STUDENTS?

This research question asks about a specific student perception of learning neurology, as defined in the medical literature called neurophobia. Neurophobia did not emerge from the data collected as an issue for student physiotherapists. Therefore the answer to this question could simply be ‘no’, physiotherapy students do not experience neurophobia in the same way medical students do. However physiotherapy students in this research did discuss some of the symptoms of neurophobia. These symptoms are discussed as difficulties in learning due to complexity and are discussed under the themes; neurology knowledge; treatment approach; and clinical reasoning. The important distinction to make from the medical literature is that physiotherapy students often did not fear the subject, although they did recognise that it would be difficult to learn. The neurophobic references in the data collected will be discussed below in relation to the background literature.

The presence of neurophobia symptoms was apparent;

> “I'm a bit neurophobic in that when you asked about the stroke patient I felt a bit like, oh my god, I don't know what to do” (N).

Although rather than fearing neurology, many of the students acknowledged being daunted by the complexity of it. It appears that the fear exhibited as anxiety is linked to lack of knowledge, skills and confidence. It is still unclear if this fear is

initiated from a perception that neurology will be difficult or because of insight into the complexity of the subject. One student acknowledges this uncertainty;

> “Neuroanatomy well, I think it’s always harder, I don’t know why, I don’t know whether that’s a perception we have of brains, that they are complex and therefore it’s difficult. But it always seemed, there are simple bits of it you would learn, like this is the structure of a neuron and all that kind of stuff, but then when you put it altogether it seemed huge and daunting. But I did enjoy it as much as everything else, it was just almost this perception you have maybe” (M)

There certainly appears to be some uncertainty about the origins of the perception that neurology is complex. Students often used the word daunt rather than fear which suggests to me that they are expecting the topic to be complex and overwhelming. Many students said they were interested whilst daunted, so this type of fear is not always accompanied with a negative effect on their interest and motivation. Students sometimes expressed increased interest because of the complexity of the subject as evidenced by the following student quotes;

> “It's still a little bit daunting because of all the words to learn, and how complicated and intricate it is but it doesn’t put me off learning it” (G).

> “I find neuro interesting, although it’s very complicated” (F)

> “I think it`s very interesting, so I`m quite looking forward to it actually, learning a bit more.” (E)

Therefore for many students the fear is about the process of learning and not because they are not interested in the subject or motivated to learn. This was also highlighted in the questionnaires, where students demonstrated a spread of levels

of interest with neurology. Neurology had the biggest number of very interested students but also the biggest number of students with very limited interest. There was also a variation in the medical literature and there were two surveys (Schon et al 2002, Youssef 2009) where neurology was not rated the least interesting.

The students who demonstrate an interest in the subject regardless of the difficulty of the subject should also find the subject easier to learn because students' who are interested will exhibit intrinsically motivated behaviour to learn (Tobias 1994). Although I do acknowledge that the students are unlikely to say that they are not interested in the subject of the research they have volunteered for and to the person who delivers the teaching. It was evident that the emotional response to this complexity affected some students in a negative manner, as they acknowledged that they lost interest because it was too complex.

One student gave an example from an MSK placement with a patient who also had a neurological condition;

> "I started reading a little bit about it, it was really complicated. I didn't know half the terms again and I didn't know what was going on and what was what so I gave up and focused on fixing her knees instead." (F)

In contrast, occasionally students said neurology was not difficult, which was also a feature in the questionnaire responses;

> "I don't agree that neurology is difficult it's just the way you approach the learning" (A)

This student is acknowledging that you can use different approaches to learning and might also be alluding to neurology requiring a different approach to those used in other areas of physiotherapy. In contrast to the medical surveys where

students felt least knowledgeable about neurology (Schon et al 2002, Youssef 2009, Zinchuk et al 2010, Sanya et al 2010), some of the physiotherapy students stated that they had equal knowledge in all areas, and were equally interested in all areas, as seen here;

> "they are all quite tricky really in the beginning, quite similar, but you get the hang of it, especially when you've been on placement" (I)

> "I think I was excited about all of them, it's been, yeh it was exciting because I didn't know a lot about certain areas, it was new and I found there was interesting things that I could do as a physio that I didn't realise" (M)

> "I think at the moment generally I am interested in all [areas]". (E)

This suggests that for some students learning neurology presents the same challenges as other areas of physiotherapy. This is in contrast to those students above who felt that neurology was more difficult. This indicates that there is a spread of opinions and the level of difficulty learning neurology is based on more than just the information itself.

The student's suggesting that they feared neurology, gave some reasons for this; such as fear of the unknown;

> "Neuro was definitely fearful because of the brain and not knowing anything about it" (D)

> "the unknown, if you look in the textbooks you just get a page of very long words that don't necessarily make as much sense as muscular skeletal words that go with the action they do, most of them anyway or with the body position they are in". (G)

> “it becomes less of the unknown and when it's that you fear it less”. (G)

The neuropathologies were also a source of anxiety;

> “ why is neuro stuff scary, because you can have a cold or something and then you’ve got guillian barre or something (nervous giggle), all of sudden you’re fine and then you have a neuro problem, that sort of anyone can get it element seems worse for neuro because if you smoke you might get a lung problem or if you train wrong you might get an MSK problem, but you’re just minding your own business and you’ve got a neuro problem. So from that point of view the conditions are much less pleasant” (I)

> “There are lots of new pathologies and complex terminology, long words and new language”(C)

but some students expressed that they were unclear where the fear had originated from;

> “There is nothing that immediately springs into my mind for a reason for the feeling that neurology is feared”. (E)

It did not initially appear that physiotherapy students experienced the high levels of neurophobia exhibited by the medical students, according to the medical literature. One limitation of this research is that the students’ were not asked specifically if they would describe themselves as neurophobic, even though they knew that this was the context of the research. Instead, their perceptions and experiences of learning were explored in an attempt to uncover any neurophobia. During this exploration it was apparent that the physiotherapy students did experience anxieties about the complexity of the information they needed to learn and the treatment of patients. Some students also expressed preferences for other areas

of physiotherapy which made them less interested in the subject and therefore less motivated to learn neurology, rather than displaying anxiety. If I refer back to the definition of neurophobia I suggested to be used within this research; “fear and anxiety associated with the anticipation and experience of learning neurology and neurological physiotherapy”, the amount of anxiety evidenced in the questionnaire comments, the observed behaviours and discussed within the interviews was high.

The symptoms of neurophobia described by the physiotherapy students were actually very similar to those of the medical students. This does suggest that neurophobia could be influencing healthcare students’ ability to learn. To provide further answers to the reasons for this neurophobia and therefore potential solutions, this research has focused on the students’ perceptions and experiences of learning neurology and neurological physiotherapy.

5.4 WHAT ARE THE STUDENTS’ EXPERIENCES OF THE UNIVERSITY BASED LEARNING OF NEUROLOGICAL PHYSIOTHERAPY?

As illustrated in the previous chapter, the themes identified from the data which will provide the answers to this question are; Neurology Knowledge; Treatment Approach; Clinical Reasoning; and Pedagogy.

The factors that were most important in describing a student’s experience of learning neurological physiotherapy were often the elements that students found most challenging. The key findings from the research in answering this question include the complexity of the new neurology knowledge that needs to be conceptualised, along with the lack of relevant prior knowledge. In addition, the challenges of learning a new approach to treatment to address complex patient presentations were mentioned, particularly where there is no definitive technique

to address each clinical problem. Linked very closely to this issue is the complexity of learning the clinical reasoning process with new complex presentations and without the experience of people with neurological conditions. Finally the students' experiences were influenced by the pedagogy, which did not always match the student's learning needs. The importance of patient experience or close simulation was emphasised in order for students to feel better prepared for placement experiences.

It occurred to me that the students talked about problems with learning the new knowledge, then the treatment approach and then how to use this during clinical reasoning (as seen in Figure 4) highlighting the progression of learning and the objectives of the teaching experience. This appeared to fit with Blooms taxonomy of educational objectives and demonstrated the move through the different levels. The neurology knowledge captured the knowledge and comprehension domains, followed by the treatment approach which captures the application and analysis domains, and finally the clinical reasoning which involves the analysis, synthesis and evaluation domains (Krathwohl 2002).

The important issues identified regarding the difficulties with learning neurological physiotherapy clinical reasoning will be discussed in section 5.5. In the following subsections the themes of neurology knowledge (5.3.1) treatment approach (5.3.2); and Pedagogy (5.3.2) will be discussed.

5.4.1 NEUROLOGY KNOWLEDGE

Difficulty with conceptualisation of neurological knowledge was a key theme within the data collected. There is limited research studying the conceptualisation of physiotherapy knowledge, specifically neurological, as discussed within the literature review.

Graham (1996) identified three techniques for learning kinesiology knowledge; discussion, visualisation and experience. The students within this research discussed the need to use similar processes within the learning of neurology. There were a number of students who identified the use of small group work and discussion as a good opportunity to learn neurology knowledge. It was acknowledged that more opportunity to discuss neurology and neurological physiotherapy would be beneficial and potentially the teaching blocks should be streamlined and extended.

One MSc student who had experienced PBL teaching suggests that smaller group discussions would have been more beneficial than the PBL feedback session;

> “When you got 20 people all discussing something and they can get there 10 minutes before me and I think I left behind me a little bit. Sometimes that`s quite tough, whereas I think if we would split into small groups to talk about things” (E)

Another BSc student highlights the benefits of repeatedly discussing knowledge in different sessions within the musculoskeletal teaching block as a facilitator for learning in contrast to the shorter intense block of neurology teaching;

> “ it’s just when you do anatomy in musculoskeletal, you have the lecture then a seminar then the management and treatment of that area and then you’d have a dissection session. So you had 5 or 6 different ways of

cementing it in your head, whereas neuro you do it and then you wait until the next year. I don't remember anything from it" (J)

The second technique used specifically for learning kinesiology was visualisation. This was a technique frequently cited as an issue of extreme frustration and a barrier to being able to learn neurology. Whereas visualisation had been a technique employed by the students previously in other subjects it was a technique that was very difficult to employ within neurology;

"When learning brain lobes etc it's difficult to apply and visualise". (C)

"it`s quite hard to visualise the brain what`s going on and when we think about muscle and limbs other things that is a bit easier to visualise what`s going on and this with the brain is not quite the same". (E)

The difficulty with promoting this technique within the neurology teaching is that the structures and functions that the students need to visualise are new and unfamiliar to the students. Whereas within other areas of physiotherapy students can integrate some of their prior knowledge;

"I guess with neuro it's just all so new. With musculoskeletal, I had done PE so the muscles and stuff was something I'd done before". (J)

The third technique identified was experience. The students in this research concurred that experience was the most effective form of learning, as they all overwhelmingly discussed learning most on placement. This poses challenges for the neurology teaching within the university to prepare students for placement because there is limited opportunity to practise with patients. The opportunities that the BSc students do experience are always very positive;

> “I really liked having the patients in, so having them in to hear their experiences, this is what a Parkinson’s patient looks like, this is what someone else looks like”. (M)

There is an additional challenge in the teaching, particularly the practical neurological physiotherapy teaching, as this needs to be achieved through role play on each other rather than on patients. Therefore the practise they are experiencing is artificial, even with the amount of work that goes into making case studies realistic, using video clips and physical demonstrations.

> “It’s hard practicing on each other here because we’re all fine, and as much as you try and pretend to present in a certain way, you can’t. Especially with neuro you can’t do it, so um, yeh”. (A)

In summary, the use of Graham’s (1996) three techniques for conceptualising kinesiology can also be applied to learning neurology. In doing so it has highlighting some of the challenges of learning using these techniques within the university context. The practice placement is the opportunity to gain experience with patients, therefore the university teaching is to prepare the students for this experience. It could be inferred that the preferential techniques to be encouraged during the university phase are the discussion and the visualisation, although it is recognised that all techniques should be employed concurrently in university and on practice placement. The challenge for the teaching team is to use methods of delivery that capitalise on these techniques.

There were other challenges to conceptualising neurology knowledge within this research which cannot be accounted for within Grahams (1996) techniques, such as being unable to link and build the new knowledge upon established knowledge.

Many students felt conceptualising musculoskeletal physiotherapy was easier than neurology because many of the concepts were familiar;

> "For the MSK I did PE so it's kind of when we think about muscles and stuff. I think of yes you use that when you throw a ball and stuff. And when I thought about doing the course they gave me a book, atlas of skeletal muscles which I looked at so it was familiar, whereas neuro was just so completely new to me". (J)

> "It's something very different for me it's not what I've ever done before, it will be very exciting and very interesting". (G)

Students also expressed a lack of personal experience of neurological conditions in society whereas every student had experienced or had known someone with a musculoskeletal condition, whether that be a broken bone, sprain or arthritis;

> "No, fortunately I had no friends or relatives with neuro problems, I haven't, no nothing. You sort of come across it in your daily life and just friends of friends telling them, you know, they've had Parkinson's or Dementia and things like that, but I haven't personally had a personal relationship". (F)

Constructivist learning theories would support the notion that associated previous knowledge and experience will makes the conceptualisation easier. Rather than having to accommodate new information, students can assimilate the information into their pre-existing knowledge (Atherton 2013).

Larsson & Gard (2006) offer another description of conceptions of physiotherapy knowledge as defined after interviewing qualified physiotherapists working in different areas, including neurology. Potentially, the post graduate rather than undergraduate/pre-registration perceptions of learning physiotherapy knowledge

may be quite different. However using the four different categories defined by Larsson and Gard (2006) in relation to the findings of this research, we can appreciate some of the challenges of teaching and learning neurological physiotherapy.

The category 'Interaction' refers to the interaction of the different types of knowledge and the sharing of this knowledge with patients. The importance of both the theoretical and the practical knowledge is highlighted. In relation to the students in this research it is clear to see that this interaction would be more challenging. The theoretical knowledge needed has been identified in this study as being particularly difficult to learn because of the complexity, the unfamiliar topic and the hidden nature of the structures and functions. This will affect their ability to discuss this theory with the patients in order to make clinical decisions. This category as defined by the authors involved the physiotherapists being able to respond to each individual differently in their interactions to achieve the desired outcome. This would be a very difficult skill for the students to achieve at their level of training due to their lack of clinical experience. The anxiety about having to make clinical decisions with the patient in front of them was identified by some students as the thing they feared most;

> "I was very apprehensive at the idea of being faced with neuro patients" (F)

In addition, neurological patients have the same normal heterogeneity in terms of personality but also have the added complication of the heterogeneity of the presenting condition, because people with the same damage to the brain will present differently. This was also an anxiety identified by the students;

> “You can have notes for the patient with area of damage explained but each person will still present differently so difficult to know and prepare for what you’ll see” (C)

Students were also in agreement that the potential cognitive, perceptual and communication problems that neurological patients could present with, would make their management more complex;

> “ it’s more of a challenge because of the other things that they might be having; like if they're confused if they can't communicate as well as they used to be able to” (N).

The interaction that physiotherapists have with the patients is a very important factor and something that one of the students identified as one of the best things about working in neurology;

> “I think the bit about physio that I love is the relationship, that you build such a good relationship with your patients because you’re with them for such a long time, every day, and you’re making a difference and they are grateful for it. That was really important, I really enjoyed that” (M)

It is important however not to underestimate the power of communication and how students in particular, as they are learning neurology, need lots of feedback about their performance. Patients will often be able to provide this feedback in different ways and if it is not possible verbally, the students may find this much more challenging. There was an example in the data where one student was acknowledging implicitly how important this feedback was, as she read other non-verbal cues from the patient to receive feedback that what she was doing was acceptable;

> “Yeah, I feel okay, especially when they smile at me” (O).

If the cognitive, perceptual and communication impairments are considered in light of the ‘interaction’ category, they would certainly affect the students ability to use the patient as an accurate source of information in order to collaborate with the patient. In this way the knowledge conception and performing neurological clinical reasoning would be more challenging.

This ‘Interaction’ category does appear to echo the processes involved in clinical reasoning, with the emphasis on integrating knowledge and patient needs, which in the case of clinical reasoning aids the clinical decision making. Larsson & Gard (2006) do acknowledge this, and make parallels with Edwards et al (2004) narrative reasoning type of clinical reasoning. Clinical reasoning will be discussed in more detail later in this chapter (section 5.5).

The second category, ‘Personal competencies’ refers to the tacit conception of knowledge related to experience. The knowledge conceived is dependent on the time, interest and ability to understand for the individual. These aspects were also identified by the students within this research as determinants of knowledge acquisition; the time required, level of interest and ability to understand were highlighted by students as factors affecting their level of neurology knowledge;

> “maybe just the time, the time to learn it, that there is less. Maybe in the first year you learn about the knee and you’ve got a couple of weeks to go and learn about the knee. Whereas say there’s a lot more information in respiratory or neuro, and you want to learn about conditions and it maybe takes you a couple of days to read up but then suddenly you’ve jumped onto something else” (M)

> “I am more interested in neuro and CVR as I prefer working in an acute inpatient setting. I find that these 2 areas capture my interest and I am motivated and want to learn more about the areas”. (questionnaire response)

> “but because I feel confident I probably feel like I know more than I do” (I)

The students involved in this research will find it very difficult to achieve the tacit learning within the university teaching, this tacit learning is achieved through practical experience during practice placements. The students also recognised and valued that this learning occurs on placement.

> “I go on placements to learn what I thought I should learn at uni …I felt that I learned a lot more on placement than I did in lectures” (F)

The students have limited or no practical experience with neurological patients and therefore their practical knowledge is purely developed through practicing on each other during role play. The problems and barriers to learning practical treatment skills in this way were frequently cited by the students. The issue for the model was the inability to empathise with and imitate a neurological patient presentation and therefore being unable to role play the presentation. The issue for the physiotherapy student role playing the physiotherapist was that the role model responded normally rather than how a neurological patient would.

> “It’s difficult to grasp the concept if you have not experienced or lived with neuro patients before” (questionnaire respondent)

One could assume that this would be the case for all physiotherapy teaching within university however one student articulates how learning musculoskeletal and cardiovascular and respiratory interventions differ;

> “If you do a percussion or something on a normal role model it feels the same as if you’re doing it on a patient it’s just you don’t get a cough at the end, if you’re teaching them exercises it doesn’t matter if they are injured or not, if you teach ACBT you can teach that. So early on in the course we didn’t know what ACBT was so you were genuinely teaching someone it. In terms of teaching exercises and stretches yes it’s the same problem. But in terms of doing physical techniques you still have to be able to recognise normal in your mobs and things, well I don’t know, so …….it’s the whole body thing rather than a localised thing, even if, I mean you can treat someone (another student role model) who in the past happened to have a sprained ankle and you can treat their ankle but it’s hard, you can’t have a whole body impairment I guess” (I)

Larsson & Gard’s (2006) third category was ‘Professional demands’ which highlights the influences of society, culture, workplace and education. Many of the professional demands identified in Larsson & Gard’s study were specifically relevant to qualified, practicing clinicians within their workplace. One significant influence on the students is the development of their own professional practice in line with the requirements of the university and the professional body- CSP (Chartered Society of Physiotherapy) and the Health and Care Professions Council (HCPC). This is not an aspect that the students chose to discuss particularly within the research, which leads you to believe that it did not significantly influence their experiences of learning neurological physiotherapy. If the research had looked at all physiotherapy learning then this might have been more readily discussed. There was considerable discussion around the societal influence on the student’s perceptions of the topic of neurology which could be relevant here but will be explored in more depth later in this chapter.

‘Scientific areas’ was the final category discovered by Larsson & Gard (2006) which refers to the physiotherapist as the expert in using different scientific areas to inform practice. The students were not in the position to view themselves as experts having only just begun to learn about neurology and neurological physiotherapy. However there were many instances where students discussed the problems with acquiring the scientific knowledge required to make an informed decision. One important issue here for the students is the amount and quality of evidence available to support neurological physiotherapy.

> “I don’t think I looked at the evidence base as much as for the other areas, and although I haven’t looked at it, it doesn’t seem as strong” (H)

> “Neurology is not well defined in the literature” (B).

The focus for knowledge in physiotherapy during Larsson & Gard’s study in the ‘scientific areas’ category, was the “ability to analyse human movement behaviour” and how this can be influenced. This is particularly important for neurological physiotherapy as the knowledge of normal movement and the analysis of human function are fundamental to identifying movement dysfunction and planning treatment. This was acknowledged by one of the student’s;

> “Well just to look at what people do and why that might work as opposed to focussing on mechanisms of damage. You don’t need to know which bits are damaged, you just need to know how you’re going to improve movement and quality of life” (O)

This invariably involves the whole body rather than a specific joint or body region which is often the case in other areas of physiotherapy. This is an area that the

students identified as adding to the complication of learning neurological physiotherapy;

> “I’m a little bit anxious about it because it’s so many things I’m not sure, because brain problems affect your whole body. You can twist your ankle, but still function the rest of the body really well and I’m just really worried I’m gonna get it wrong” (F)

The treatment used to increase functioning was also an area of debate for the students as some felt this approach was less specific and therefore easier while others felt the handling had to be much more specific to achieve the desired movements.

> “but this is just telling them how to move or pulling them up, what’s so difficult about that?” (OBS 3)

One student recognises that you could take either a specific or global approach to the treatment;

> “I think in my own head I found it easier to simplify neuro, um I think, I feel like musculoskeletal is very technical and very um, if it’s going to be good it’s got to be specific. I think you can have a lot more global success with techniques that are quite general really, which is awful but um as long as you get people moving you can get results. It’s obviously better if you’re specific and know exactly what you are looking for and why, but you could get those results anyway, like you could get to that end. Um yeh I don’t know” (B) followed by:

> “I had a really good educator and she really pushed me and very much about specifics, and not letting me get away with that general approach,

> um, and the clinical reasoning aspects which I perhaps hadn't used as much in the previous resp placement because … you just had to do it and there were less techniques to choose from…. It was suddenly taking a step back and really thinking about what I was doing and why. Maybe respiratory is a good example, often the best thing was to get patients up and walk them, and it's quite tempting to just do that again, but I very much had to think about why I'm doing things, so how and why are you walking them". (B)

In summary, the categories for conception of physiotherapy knowledge defined by Larsson & Gard (2006) have not been reflected in this research into students learning neurological physiotherapy. This will be in part due to the different contexts for pre-registration students versus qualified clinicians and will also be influenced by the focus on neurological physiotherapy rather than physiotherapy practice more generally. Having said that, the categories do provide an interesting framework to start to unpick some of the challenges for learning neurological physiotherapy, specifically for university students and potentially for clinicians. These include; the potential barriers to interaction with the patients, the complexity of neurology scientific knowledge and the limitations of learning in the practical room instead of with patients.

In this research, rather than attempting to define how knowledge was obtained the students have discussed the difficulties with conceptualising the knowledge as it is taught within university. If we consider the methods involved in the conceptualisation of knowledge within each of the 4 categories the focus of the university education in preparing for placement experiences is primarily within the fourth category, 'scientific areas', with some emphasis on 'interaction' and 'professional demands'. During the practice placement experience the students

will develop further in all of these categories and most significantly the additional category ‘personal competencies’. One argument might be that the university needs to prepare the students in all of these categories to be receptive to the learning as it occurs by being explicit about these methods of conceptualising neurological physiotherapy knowledge. This is advocated by Larsson & Gard (2006) and something that the university currently attempts but implicitly, rather than explicitly. Ideally Larsson & Gard’s (2006) research could be replicated with students to identify how students conceptualise physiotherapy knowledge, from the novice stance. This would help to more directly inform pedagogy within the university phase of the programmes.

Larsson and Grad’s (2006) study and similarly with Graham’s (1996) conceptualisation techniques, and previous literature illustrate the importance of experience, providing support for the large element of practical experience, a minimum of 1000 hours, that the students have to complete during their training.

The ways in which this knowledge is taught, and the changes that could be made to formal learning to better facilitate students to learn this knowledge will be discussed further in the pedagogy theme. Also closely linked to discussion regarding the perceptions of neurology discussed above, is the need to consider the influence of the informal and non-formal learning of neurology knowledge that occurs.

5.4.2 TREATMENT APPROACH

The students within this study found the treatment approach in neurology quite different compared to other areas of physiotherapy, which added to the challenge of learning neurological physiotherapy clinical reasoning and decision making.

There were a number of reasons given for this, including the specific and physically demanding handling techniques used, the lack of definitive techniques for each presenting condition, and the uncertainty regarding predicting prognosis. These issues will now be discussed.

STUDENTS NEED THE TREATMENT ANSWERS

The key issue for the students involved in this research was the lack of a black and white answer or technique to be used for each presenting condition. In neurological physiotherapy the challenge is being able to specifically problem solve the reason for the presenting problem and then to transfer all their knowledge of skills and techniques to problem solve an appropriate treatment adapted to the specific context. It should be acknowledged how complex this task is. A neurological assessment includes " a process of collecting information about disordered movement patterns, underlying impairments, activity restrictions, and societal participation of people with neurological pathology for the purpose of treatment planning" (Ryerson 2009:113). The assessment needs to be performed effectively to determine the problems that require treatment however the student still needs to decide which treatment is best to address these problems, which may involve some creativity.

The discussions during the interviews and the observations suggest that students are expecting to be given the treatment answers to the problems for each neurological condition rather than reasoning the underlying impairments and deciding on their treatment options. Lennon (2004:371) identified this as a key point in her chapter stating that "neurological physiotherapy is problem-based, not condition-based". This is very different to the approach taken in the musculoskeletal block of teaching that precedes the neurology block. In year 1 of

the programmes students learn about each joint and body region, they consider the potential conditions affecting the region, and have techniques demonstrated to them for the assessment and treatment of the joint/region, which they then go and practise on each other supervised. This is subtly different to the neurology teaching where, in the BSc programme the students' are given case studies to devise a problem list from and create treatment options to practise and share with the group. In the MSc programme the practical skills are taught in a similar way although the case material is all part of the EBL fortnight.

The students in this research did not choose to discuss the traditional approaches adopted by clinicians in neurology in any great detail, although this is unsurprising given that the consideration of approaches such as Bobath and Movement Science (motor re-learning) is limited within university. Lennon (2004:369) highlights that qualified "therapists tend to rely on their preferred treatment approach and their clinical experience to justify the theory and knowledge they use to treat patients". This is challenging for students learning neurology because they do not have any clinical experience and they are taught a problem solving approach to treatment which utilises all their physiotherapy skills, rather than conforming to one of the neurological approaches. These neurological approaches such as bobath or movement science are taught at a postgraduate level. This does imply that students may experience difficulty in learning whilst on placement, if their educators are justifying their clinical decisions using the knowledge of a specific approach.

It was during practice placement that many of the students appreciated how transferable their skills were to neurology, particularly those learned in the musculoskeletal block. It is an on-going challenge to facilitate the students to become aware of this during their teaching block as evidenced in OBS 2 during

our discussion about using the musculoskeletal assessment skills with a neurological patient.

The transfer of learning is one of the goals of the teaching, where knowledge is applied in new ways in new situations. Transferability of knowledge and skills and subsequent learning will be affected by prior learning (Schunk 2012). The key for teaching is to facilitate students to acknowledge their prior learning so that they can build upon this through transfer of learning to the new situation.

HANDLING- SPECIFIC VERSUS GLOBAL

The conflict identified in the data from some students about whether neurological handling was more specific or more general could represent confusion between the hands-on facilitatory handling techniques used and the emphasis on functional more global movements. It could also reflect a debate about the specific level of analysis used by the students to observe movement dysfunction at impairment, activity and participation levels, as defined by WHO (2010). A problem can be addressed at any of these levels, and treatment options aimed at each of these levels. I suspect that students have been trained during their musculoskeletal teaching to work primarily at the impairment level, which is possible because the problem is often very localised. Whereas within neurology it is often more beneficial to focus treatment strategies at the activity level as there are so many body regions and impairments involved. However this does not mean that the student/clinician does not problem solve the impairment level problems, because these can also be treated specifically. These two students refer to being ‘specific’ versus ‘functional’ or ‘general’ and although they do not recognise this distinction, you can infer this as body structure and function problems (impairment) versus

disability (activity). The connotation here is also that using functional movements is inferior in some way to using techniques to treat impairments;

> “Probably, because I know you should treat everyone functionally, but you’d probably be less inclined to treat functionally in an outpatient setting because you can be a bit more specific If obviously your patient is appropriate to do that, it might be worth being more specific. Whereas if it was neuro you would go straight in for being as functional as possible from the off” (I)

> “I think in my own head I found it easier to simplify neuro, um I think, I feel like musculoskeletal is very technical and very um, if it’s going to be good it’s got to be specific. I think you can have a lot more global success with techniques that are quite general really, which is awful but um as long as you get people moving you can get results. It’s obviously better if you’re specific and know exactly what you are looking for and why, but you could get those results anyway, like you could get to that end. Um yeh I don’t know” (B)

This was also observed during OBS3 as one student during a practical session re-educating sit to stand said;

> “but this is just telling them how to move or pulling them up, what’s so difficult about that?”

This was a clear message that the student did not feel this was challenging and that this approach to treatment was simple and by no means difficult to clinically reason. She was thinking at an activity level in relation to the ICF classification. When I asked her to problem solve why sit to stand might be a problem for this

patient, she could clearly identify that the hip extensors could be weak. However when asked how she could strengthen these muscles during sit to stand, she said;

> "I know we could get the patient lying prone on the bed and do some resisted hip extension".

This was a perfectly good strategy, but what she had identified was an impairment level treatment for the impairment. Rather than being able to problem solve how the impairment level problem could be treated during an activity. The group then went on to practise how they could help to maintain joint and muscle alignment with their hands during the activity (using their knowledge of kinetics and kinematics) so that the muscles were facilitated to be active, and how they could change the foot position so that the weight could not be compensated over onto the other leg, and many more options. The students needed help to problem solve in this way.

PERCEIVED LACK OF AN EVIDENCE-BASED APPROACH

Many of the students in the research felt neurology and neurological physiotherapy was more difficult to learn because there was not enough supporting evidence. This resulted in students feeling less confident in their knowledge.

> "Difficult to make sense of neuro PT because difficult to define the approach". (B)

The students are encouraged from the beginning of their training to use evidence-based practice, which is supported by the new NHS system which aims for clinical excellence achieved through best care supported by the best evidence (NICE 2013). The pressure for students to justify their decisions using theory and evidence is very real. Evidence based practice is the integration of expertise from

practice with research evidence to inform clinical decisions (Sackett et al 1996). This clearly poses more of a challenge where there is limited evidence. Sparkes (2000) illustrates how a lack of evidence can cause problems producing evidence-based practice as she discusses the need for evidence to support handling techniques in neurological rehabilitation. The conflict between manual handling restraints and the use of therapeutic handling by physiotherapists could potentially put patients and students/clinicians at risk. One student reflects on how physically demanding it was working with stroke patients;

> "I haven't really enjoyed working with stroke too much in the last because, the people I've worked with have been quite heavy strokes and it's quite hard, it's hard work, it can be really hard work just to get a little bit" (L)

Pomeroy and Tallis (2003:601) state that "there is an inherent tension between the immediate push to provide evidence for current practice and the longer-term need for a high quality research base for neuro-therapies". Although this evidence is growing, the uncertainty is a problem for students as they learn to make clinical treatment decisions, because initially their evidence-based decisions are biased towards the evidence available rather than the expertise derived from practice due to their limited exposure to patients. One student comments on how the theories behind treatments were not straight forwards:

> "I found it quite confusing, I thought in theory it should be quite simple you know like you just learn your anatomy, but there were a lot of things that kept coming in, I'm trying to think of examples now...like the theories behind treatments that it wasn't as simple as that". (B)

In a crude attempt to illustrate the difference in amounts of evidence available for each of the core areas of physiotherapy, I did some simple searches on the PEDro

(Physiotherapy Evidence Database). PEDro is a free database of randomised trials, systematic reviews and clinical practice guidelines in physiotherapy. The numbers of evidence are given below for each of the core areas;

Simple Search Term	Numbers of evidence
Musculoskeletal	5910
Cardiovascular	1182
Respiratory	2567
Neurological	328

Some caution needs to be employed here as this was just a simple search and will potentially have missed much relevant research. It is also important to consider that some interventions, patient groups, and areas of practice may be easier to research than others. However it is clear to see that numbers of neurology related evidence is significantly less than the other core areas. This is simply indicating the numbers of trials and reviews, it does not infer that there is no evidence to inform practice. In fact, Moseley et al (2000) analysed PEDro for the extent and quality of evidence for neurological physiotherapy and concluded that there is a substantial body of moderate to high quality evidence relevant to neurological physiotherapy. The amount of evidence also continues to expand at an exponential rate (Moseley et al 2002). Most recently Veerbeek et al (2014) conducted a systematic review and meta-analysis of evidence for physiotherapy post stroke and concluded that “there is strong evidence for PT interventions favouring intensive high repetitive task-oriented and task-specific training in all phases post stroke.

The guidelines produced by the Royal College of Physicians (2012) for Stroke, in particular the physiotherapy concise guide, and the recent NICE (2013) stroke rehabilitation guidance are examples of summaries of the available evidence for students and clinicians working in neurology. There are similar examples for other neurological conditions, including MS, Parkinsons and Long term conditions (NICE 2003, NICE 2006, RCP 2008a). Students can access these guidelines to ensure they are using the best available evidence and provide evidence-based practice.

Potentially, students perception of lack of neurological physiotherapy evidence could be the result of their comparison to experiences from other core areas of practice, where they might have found research evidence to support specific interventions for specific conditions/symptoms. Much of the current evidence base supports principles for treatment rather than specific interventions. Many of the specific interventions used by neurological physiotherapists require further research to support their use and to define recommended guidelines (Jackson 2012). However, as seen in the review by Veerbeek et al (2014), intensive high repetitive task-oriented and task-specific training are evidence based guiding principles of treatment rather than a specific intervention. There are also Cochrane reviews which review the available evidence informing the principles for treatment, and interventions that apply the principles. The problem-solving approach used within neurological physiotherapy requires the student or clinician to use their knowledge, experience and the available evidence to choose an appropriate intervention to meet the patient's needs. This research study has highlighted that students find this very difficult.

5.4.3 PEDAGOGY

The pedagogy employed for each of the two courses included in this research is distinctly different. However interestingly, their experiences and thoughts about learning neurological physiotherapy are very similar. The BSc programme which attracts predominantly school leavers maintains a high level of traditional didactic lectures which are blended with small group activities, student-led activities and some PBL. The MSc programme is delivered solely through an EBL approach. The learning aims, objectives and supportive materials used within the neurological physiotherapy block are very similar across both programmes. The teaching team area also the same on both programmes. The students' reflections on their experiences of these pedagogies and their suggestions for improvements are discussed below. The key issues identified were; the need for an integrated approach to learning which addresses the learning needs of the individual students, and the opportunity to practise on real patients rather than using each other as role models.

INTEGRATED TEACHING

It was frequently expressed by the students that the integrated approach to teaching neurology was most beneficial. The optimal environment highlighted to consolidate this learning was during practice placements, as this learning could be integrated in the real context of patients. This was particularly relevant to the practical skill acquisition because students found this very difficult to learn and practise on each other as role models. This can be explained using the experiential learning theory, which necessitates that the individual has relevant experiences to reflect upon, gain feedback, construct mental models, then hypothesis test and action plan, all of which is generally logged as portfolios of

evidence (Dennick 2008). Dennick (2008) illustrates how the experience is at the heart of all theories of learning and demonstrates the parallels between concepts from Constructivism, the scientific method and Kolb's experiential learning theory using the figure 6, with experience at the apex.

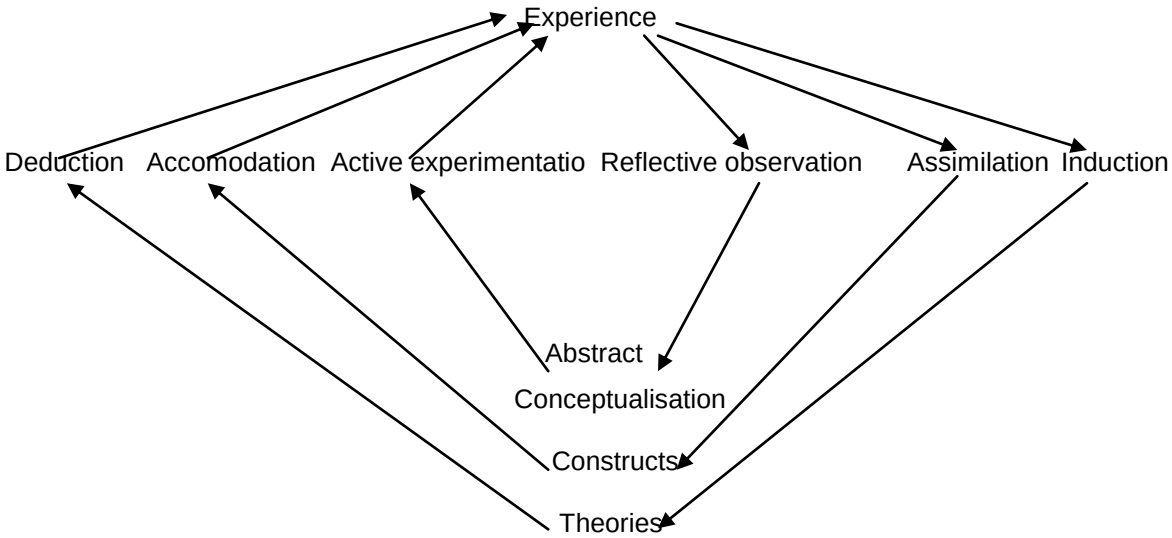


Figure 6. Parallels between concepts from constructivism, the scientific method and Kolb's experiential learning theory (taken from Dennick 2008:25).

This reinforces the effectiveness of the learning environment during practice placement. This is the environment that provides the most clinically relevant experiences. The university teaching does aim to present an integrated approach to the teaching with realistic scenarios. However, unless the patient is actually present the context of the problem solving is very different and the cognitive process involved in the problem solving will be different, as suggested in the context-dependent process identified by Cruz et al (2012). The pressure of peers as opposed to the pressure of the patient presence results in a different context for the decision making processes. This was observed when the patients were present in the teaching session for the BSc students. The students that had been

very relaxed and almost flippant within the practical sessions using each other as models were observed to freeze in the presence of the patient initially.

Students also criticised examples where the anatomy and pathology was taught in the first year, but then there was a break before the pathology and treatment was taught within the second year of the BSc programme. This is an important criticism because this does go against the benefits of integrated learning and the solution to this would be to either introduce a basic neurological patient scenario during this teaching in the first year or move the human sciences teaching to year one. The assumption that students will remember this teaching is not made and the students are forewarned to revise this knowledge prior to the neurology teaching. This is an important consideration in light of D'Eon's (2006) findings that for the topic of neuroanatomy medical students had a 46.5% loss in knowledge from year 1 to year 2.

It has previously been discussed under clinical reasoning that the type of decision making that is promoted in university as preparation for their practice placements is predominantly hypothetico-deductive in nature. It is therefore not surprising that the pedagogy used to promote this learning is the constructivist theory of learning which has parallels with scientific methods (Dennick 2008), in particular Enquiry-based learning within the MSc programme and case-based practical sessions within the BSc programme.

PATIENTS/VIDEOS

There were suggestions from many students that the teaching should involve more patients and more use of video of patients in an effort to integrate the knowledge and learn clinical reasoning in context, which is a notion supported elsewhere in this thesis, notwithstanding the resource implications. This was also seen as a

preferable alternative to learning practical skills through role play. It was evident in my observations (OBS 3) and through interview discussions that students were unable to empathise with the patients sufficiently for the role play to be effective. The simulation of patients is difficult for students and may require more of the effort of learning than learning the role of the physiotherapist. As Galloway (2009) discusses the use of role play can be low cost simulation and very beneficial but only if “fidelity to the real situation” is achieved, as this will allow the student to learn how they would react in real life, which many of the students in this research would suggest it is not. I return to an earlier question in response to this dilemma, are we teaching students how to be neurological physiotherapists, or are we preparing the students to be receptive to the experiential learning during their neurological practice placements, where they will learn how to practice neurological physiotherapy? If it is the later then we need to be very explicit about this for the students to prevent frustration, which can be seen in one of the student’s comments;

> “I feel we learn on placement what I thought we should have learnt in university” (B)

ADDRESSING INDIVIDUAL LEARNING NEEDS

The key learning needs that students felt could be better addressed within the neurological teaching were the kinaesthetic and visual needs. If these needs are considered in relation to the preferred learning styles defined by Kolb’s learning style inventory (Milanese et al 2013), the kinaesthetic experience could belong on the active experimentation mode for translating experience in the accommodator learning style (feeling and doing). The visual learning style could sit in the reflective observation mode in the assimilator learning style (thinking and

watching). It is recognised that students will have a preference for a style for learning new information and they could adopt strategies to learn more effectively. Ideally the student should move through the cyclical model, experiencing, reflecting, thinking and acting (Dennick 2008). Milanese et al (2013) investigated the preferred learning styles of final year physiotherapy students related to clinical education. The three uniform preferred styles were converging, assimilating and accommodating which resonates with the learning styles that the students in this research asked for more of. Milanese et al (2013) suggests that during clinical education the students would prefer the learning to come from a theoretical perspective (abstract conceptualisation) rather than in front of a patient so they have the opportunity to consider the situation before experiencing it. The transformation of this experience into knowledge would preferably come from practise with a real patient (active experimentation). In effect this is what happens from the university education to the practice placement, the students learn the theoretical perspective in university prior to actively experiencing the treatment of patients on placement.

As previously indicated in the data analysis the specialised skills that are used within neurological physiotherapy are the specific observation of posture and movement along with the specific handling and facilitation. These both correspond to the visual and kinaesthetic methods that the students requested greater use of. I wonder if the students are subconsciously recognising the significance of these methods for neurological physiotherapy. Certainly, the teaching should be utilising these methods to develop these skills in preparation for neurological practice placements. In response to the difficulty in envisioning the brain, Walsh (2000) documents his hands-on approach to understanding brain anatomy which appeals to visual, auditory and kinaesthetic learning needs. It involves using both hands to

model the brain anatomy and the students have to imitate the words and movements used. This is one example of using creativity to address all the needs of learners.

5.5 WHAT ARE STUDENTS' EXPERIENCES OF LEARNING CLINICAL REASONING IN NEUROLOGICAL PHYSIOTHERAPY?

The final research question posed asks specifically about the student experience of learning neurological physiotherapy clinical reasoning. The answer to this is that students find this a very difficult process to learn, particularly within the university-based teaching. It is apparent that students find the key factors discussed in the themes above (neurology knowledge and treatment approach) as important contributors to the difficulty experienced with learning neurological physiotherapy clinical reasoning. The most influential issues being; the complexity of the new knowledge required to inform decision making; the lack of experience with patients; the complexity of the patient presentations both in terms of symptoms and body regions involved; and the problem solving approach required to plan and evidence treatment decisions. The remainder of this section will discuss the most relevant theme that emerged to answer this question, which was clinical reasoning.

5.5.1 CLINICAL REASONING

The most frequently cited reason for neurophobia and the perceived difficulty in neurological physiotherapy was the complexity of the presentation of neurological patients and the difficulty being able to clinically reason the presenting problems. The interpretation of the information gathered from the patient is an important part of all the clinical reasoning models (Jones et al 2008, Smith et al 2008). It is the

gathering of the information which students were often anxious about, as many stated that the communication, perceptual and cognitive problems were primarily the ones that made the patient more complex. Patients experiencing these problems will potentially be unable to provide the therapist with the reliable information they require verbally. The students will have relied primarily on what the patient has to say in many other areas of physiotherapy. For many students the challenge will be optimising the use of other skills to find the information required to form hypotheses. This usually results in the use of skilled observation as Plummer et al (2006) found in their study of clinical decision making by physiotherapists working with patients with unilateral neglect. Plummer et al (2006) found that patient information during assessment was obtained more through observation than questioning the patient.

The observations are used to give clues about how the patient can move and what movement dysfunction they may be experiencing. Jensen et al (2000) illustrated this when defining a movement dimension to expert physiotherapy practice. Observation is potentially a skill that needs to be practised more during the university teaching to prepare the students for practice placement experiences although it is difficult to truly practise this skill without observing real patients. This concurs with the students who asked for greater patient contact in the teaching.

The biopsychosocial model of clinical reasoning (Jones et al 2008) does not define the method of accessing the information used by the therapist, so this could be obtained via questioning or via observation. Perhaps a clinical reasoning model that can be utilised by students in learning neurological physiotherapy should suggest all the methods of accessing information, particularly when impairments prevent certain methods. One of the areas where there could be added complications within this model when considering neurological patients, is the

collaboration with the patient and the process towards self-management. This involves the therapist being able to accurately predict prognosis in order to educate the patient and their family, which is an aspect of the management that students found quite daunting. This also highlights another aspect of the neurological clinical reasoning which is not explicit in the biopsychosocial clinical reasoning model, the consideration of the family and carer roles. Some of the students expressed this anxiety in their discussions, stating that families had high expectations of the physiotherapist input and that the physiotherapist was seen as a pillar of support. In this situation it is essential that the physiotherapist is able to consider these expectations when planning treatment and when negotiating these plans with the family.

In summary, when viewing the biopsychosocial model of clinical reasoning in light of discussions pertinent to students learning neurological physiotherapy it appears that some aspects could be added so that it was more explicit and specific to neurology. This would mean that the model could then be used in the teaching of neurological physiotherapy clinical reasoning. The aspects that would need further clarification are the methods of accessing patient information with specific reference to observation skills, a change of emphasis from searching for diagnosis to predicting prognosis, and the explicit role of the family and/or carers in the collaborative process particularly where patients do not the capacity to make informed decisions due to lack of insight for example.

If the generic biopsychosocial clinical reasoning model is going to be used as a template in teaching neurological physiotherapy then all the stages need to be defined and considered in this context. Clinical reasoning as defined by Higgs et al (1999:13) is “the thinking and decision-making processes associated with clinical practice”, and therefore neurological physiotherapy clinical reasoning would be

‘the thinking and decision-making processes associated with neurological physiotherapy clinical practice’. I suggest that a variation of the clinical reasoning model is required for each profession and each speciality, if it is to be specific enough to guide the teaching of the process. Although I acknowledge that this would not be a simple modification. It was highlighted within the literature review that this is a multi-faceted process that needs to take account of the knowledge, the clinician, the patient, and the environment and context. For each of these components there will be aspects that are specific to the profession and the speciality.

The knowledge component for example can be interpreted in a number of ways. Mattingly & Fleming (1994) describes tacit knowledge and the 2 processes in which this knowledge might have been acquired. The first being concrete or conscious learning such as formal lectures which could be from undergraduate teaching or courses, which is then settled in the tacit domain. The second originates from practical experiences, which might be working with patients and observing colleagues but has never been verbalised. Physiotherapy in common with other professions has the large element of tacit knowledge, which is considered to be essential in expert practice (Mattingly & Fleming 1994), but this means that “we know more than we can tell” (Polanyi 1966 cited in Mattingly & Fleming 1994). If much of our knowledge is based in ‘action’ rather than in ‘language’ (Mattingly & Fleming 1994), one might suggest that justification of clinical decisions may be difficult for physiotherapists to articulate but might be easier to recognise or observe practically. This supports the students overwhelming feedback that the most learning takes place during practice placements.

The knowledge of neurology and neurological physiotherapy is essential as 1 of

the 3 key factors in physiotherapy clinical reasoning; knowledge, cognition and assessment context (Jones et al 2000). Similarly to the 2 tacit knowledge processes, both propositional neurological knowledge, 'knowing that', which is achieved through formal methods, and non-propositional neurological knowledge, 'knowing how' which is learnt experientially, (Higgs & Titchen 1995) are required in order that patients are treated efficiently. The historical lack of neurological physiotherapy evidence in this field resulted in a bias towards non-propositional knowledge passed down through the profession through observation of experts and experience. This student provides an example of how non-propositional knowledge develops over a period of time and how a pattern recognition approach is more characteristic with experience.

> "Initially being on my stroke placement I struggled to pick up the patterns and from assessment to assessment it was difficult to get into a, not a rhythm but, I did struggle but then after about 3 weeks, I reckon it was about half way, then I started to recognise certain sort of patterns in patients which made it easier" (H)

This example illustrates how pattern recognition can only happen as you become more experienced, although it is recognised that this is not the more elaborate pattern recognition used by experts (Doody & McAteer 2002). In university due to the lack of opportunity to practise on patients students are taught a hypothetico-deductive reasoning approach which is more typical of the novice student, as generation of hypotheses and hypothesis testing is encouraged.

Cruz et al (2012) have researched final year physiotherapy students' perceptions of clinical reasoning in musculoskeletal physiotherapy. Through the emerged data, four processes were defined in relation to the way they understood and approached clinical reasoning for musculoskeletal conditions. In the absence of a

clinical reasoning framework specific to neurological physiotherapy, Cruz et al's (2012) work will be adopted as a potential framework for confirmation and comparison. This provides more than just the opportunity to explore if the physiotherapy students in this research have the same perceptions of clinical reasoning as those in the Cruz et al (2012), but also an opportunity to explore if and how these processes are addressed in the university to facilitate the students to learn how to clinically reason in neurological physiotherapy.

Cruz et al's (2012) four processes have also been adopted here as a structure for the discussion of the research findings because it is the only work which has been defined through the experiences and perceptions of students. It is not looking at expert clinicians experiences of clinical reasoning, which is the case for many authors, which would not be as relevant for the novice student. Whilst I am not suggesting that the work of Cruz et al (2012) is generalisable and that this is the only method of defining the processes involved in clinical reasoning, my experience leads me to believe this would be representative of students within our university discussing musculoskeletal clinical reasoning. Therefore it appears to be a sensible framework from which to discuss my findings specific to neurological physiotherapy.

The all-encompassing nature of clinical reasoning can be illustrated here as all of the interviews emergent themes can be categorised into the 4 relevant processes. My research had intended to explore the student experience of learning neurological physiotherapy but in hind sight, it could also have been defined as an exploration of students learning neurological clinical reasoning. It can be seen here (overleaf) how the findings could fit the four processes;

- **Instrumental process**, which could include many of the complexities identified in the clinical reasoning in learning the instruments/skills for assessing and treating neurological patients.
- **Clinician centred process**, which could include the pressure of the perceived importance of the role of the neurological physiotherapist.
- **Knowledge dependent process**, which could include the difficulties students have conceptualising neurological knowledge, and the influence of the teaching pedagogy.
- **Context dependent process**, which could include the context of the influences on the student's perception of neurology and the presence of neurophobia. It would also house the discussion of the complexity of patient presentations which emerged under the theme of complexity of clinical reasoning.

Each of the four processes will be discussed in more detail in light of my research findings.

Instrumental process

This process as defined by Cruz et al (2012:551) refers to "the cognitive nature of the process and its role in clinical diagnosis and in selecting appropriate treatment procedures", there is a "dominance of diagnostic reasoning", and the "identification of the patients problems was the major focus of reasoning". The emphasis towards determining the diagnosis might be more relevant for musculoskeletal physiotherapy settings whereas within neurology the diagnosis has often already been made through medical investigations and the bias is more towards problem solving the presenting problems and symptoms. This student acknowledges having more confidence in treating symptoms but does not appear to recognise that potentially finding the diagnosis is less of a priority in neurological

rehabilitation. It could be the case that the student is alluding to being unable to problem solve the underlying impairments which is slightly different to finding the diagnosis.

> "Despite the wide variety of presentations and causes of impairment in Neurology I feel I would be able to treat the symptoms but be less skilled with diagnosis". Questionnaire respondent

The instrumental process is relevant within neurological physiotherapy but would need to focus more on the problem solving of presenting symptoms than the diagnosis and would also need to include the importance of interpreting observations. This has been discussed earlier within this research and was highlighted within previous research into decision making with unilateral neglect, to include the emphasis on observation as an assessment method (Plummer et al 2006). Some students acknowledged that neurological patients are sometimes more difficult to assess, although they found it more challenging to articulate the specific reasons for this.

> "Normally msk patients are a lot more medically stable than neuro or resp, so they are easier to sub and objectively examine" Questionnaire respondent.

Clinician-centred process

The students within Cruz et al's (2012:551) study discussed how clinical reasoning was "essentially thinking processes that belong to the clinician", therefore a clinician-centred process. This is interesting terminology when you consider that the whole ethos of the NHS has been towards a patient-centred approach. This finding could be illustrating that the students need to be confident in their own knowledge and clinical reasoning before they can practise a more collaborative approach with patients as seen in the biopsychosocial model of clinical reasoning

(Jones et al 2008). The complexity of the biopsychosocial situations of neurological patients will inherently make the process far more complex in collaboration. This clinical reasoning process also highlights the “patient’s main role to be provision of accurate and useful information”. The inference here is that this information will be provided through questioning and will be accurate, which is sometimes difficult to achieve with neurological patients, as one questionnaire respondent writes:

> “During assessment difficulty communicating with some patients (more so than any other area)” Questionnaire respondent

In addition, within the musculoskeletal context the “patient needs were equated with the need to bring abnormal medical symptoms back as close to normal as possible”, again this may be more pertinent to musculoskeletal physiotherapy where most often this is the goal of treatment. Whereas within neurological physiotherapy the goals might be to maintain or improve someone’s physical functioning but may not be to return to normal, as one of the interviewees illustrates;

> “but it also reminds me that it will be bit where you might not cure someone, like in MSK, nine times out of ten you can get that person doing exactly what they were doing before, so it’s about being realistic I think, and remembering to be realistic” (G)

This clinician-centred process also infers that the decisions will be made by the student (clinician) rather than informed choices made by patients. There was much less emphasis within this process on patient needs and expectations, which would be essential working with neurological patients. The patients and/or family and carers would need to be active in the clinical reasoning process as they will know

the aspirations of the patient with regards to the participation level problems and goals.

The thought processes involved in clinical reasoning are essentially performed by the student (clinician) within all areas of physiotherapy. However for this process to work within neurological physiotherapy the process needs to be more collaborative with the patient which will make the process more complex. This is because it is not just about assessing the impairments and providing treatment to cure the problems, it is about improving the movement efficiency to improve someone's social situation, which is very subjective and personal to each patient. This was recognised by one of the students during the interviews.

> "Well just to look at what people do and why that might work as opposed to focussing on mechanisms of damage. You don't need to know which bits are damaged, you just need to know how you're going to improve movement and quality of life" (O)

Knowledge dependent process

The third process involved in the clinical reasoning was defined as the knowledge dependent process which is stated as "dependent on a deep sound theoretical knowledge and cognitive skills, followed by clinical experience " (Cruz et al 2012:552). This knowledge dependent process is supported by other researchers who recognise the importance of the consultation with research evidence during clinical decision making (Nierenberg 2009 and Smith et al 2008). I think the students in this research would agree that this is also relevant for neurological physiotherapy and this is one of the main anxieties in learning this knowledge. These issues were discussed during the preceding sections of this chapter illustrating that neurological knowledge is difficult to conceptualise and is often lacking researched evidence base, which results in students feeling under

confident to integrate this knowledge. The importance of the clinical experience is emphasised throughout and the students agree that clinical reasoning improves with clinical practise both as a student and a clinician. Cruz et al (2012:552) indicates that “the experiential knowledge is of great importance to understand each patient’s individual specificities”, which is important in all areas of physiotherapy including neurological physiotherapy because, as these students identify, all patients present differently.

> “You can have notes for patient with area of damage explained but each person will still present differently so it’s difficult to know and prepare for what you’ll see” (C)
>
> “If one bit’s affected it affects something else in some people but not in others. Just the fact that it’s very different between individuals” (O)

There are challenges for the students learning neurological physiotherapy to acquire the knowledge required although it is recognised that this deep theoretical knowledge is essential. The importance of the knowledge obtained from our neurological patients should not be under estimated here, which is more than learning through experiential learning, and more about finding out about the patients experience and goals and aspirations.

Context dependent process

The context was seen to influence the clinical reasoning process (Cruz et al 2012), which would make sense between specialities and within specialities. For example Smith et al (2007) researched decision making in acute cardiorespiratory and also found that the decisions were influenced by the context, along with the type of decision and the physiotherapists characteristics. One of the aspects of the context that seemed particularly important was the time available, “for some students the quality of their reasoning and practice seemed to be dependent on

the time available to assess and treat their patients" (Cruz et al 2012:552). The traditional musculoskeletal outpatient setting is structured differently to most neurological physiotherapy settings and is very often a placement that students find very difficult to time manage. The timings for assessing patients varies at different locations but is usually 45-60 minutes and the treatment of patients is usually 20-30 minutes, this poses a challenge for many students. The issue of time to learn was also an issue highlighted within this research, as students felt they knew more when they had spent more time learning the subject. This included time for taught sessions but also time to assimilate knowledge between teaching sessions, as seen below. The time element seems key to learning and performing clinical reasoning as a student.

> "So given more dedicated neurology teaching time then they may feel more supported in this area and may overcome their difficulty in this subject". Questionnaire respondent.
>
> It transpired that they were anxious because of the short amount of time they had to consolidate the information and that they felt more confident with musculoskeletal assessment because they had been using it for so long. (Taken from OBS2)

The students in the Cruz et al (2012) study were also aware of different contextual factors that could influence clinical reasoning process e.g. "clinicians, patient's characteristics, contextual factors and the type of condition". The influence of each of these factors will be different in each speciality and subspecialty, with some aspects being more complex than others. The contextual factors for neurological patients will very often include the changing social situation to accommodate long term changes in physical function which will add further complexity to the situation.

In the context of learning neurological physiotherapy and the neurological patient experience there are a number of issues to consider. It appears that for some students they can learn the neuro anatomy, physiology and pathology and even the presenting symptoms but when the time comes to make sense of this all with a patient present that's when the difficulty presents itself and the anxiety levels increase.

"I'm apprehensive at the idea of being faced with neuro patients".(F)

The distinction here for our students is using their knowledge in the change in context from the university into clinical practice with real patients. It seems that no matter how much the university does to prepare the students, it is performing clinical reasoning in the presence of the patient that is the real fear.

> "if I was for whatever reason with a stroke patient I don't think I, in my head, I don't think I would have the tools to be able to do, know what to do, regardless of whether I actually did or not." (N)

Perhaps the obvious solution to this situation is to find the resources to include more expert patients in the university teaching which has been advocated by the students, or to be more explicit about the role of the university education in preparing for practice placement where clinical reasoning will be developed.

To conclude the comparison with Cruz et al's (2012) four musculoskeletal clinical reasoning processes, all of these four processes are also relevant for students learning neurological clinical reasoning. The aspects that need greater consideration within these processes in the context of neurological physiotherapy are; the use of observation assessment method during the instrumental process and less emphasis on diagnosis and more emphasis on problem solving the impairment, activity and participation problems; greater collaboration with the patient and family during the clinician-centred process and realistic goal setting

and planning; appreciation of the complexity of neurological knowledge and the importance of knowledge acquired from the patient in the knowledge dependent process; and finally the context dependent process should explicitly consider the patient holistically, including the social considerations.

The final process that has not been identified here by the students in the context of musculoskeletal, which might have been identified had it been in relation to neurology, is the multi/interprofessional clinical reasoning process that is essential in the team approach used for the management of neurological patients. One student interviewee states;

> “Also a large number of people, professionals are involved in the patients care to also work with, unlike MSK, it tends to be one to one” (D)

5.5.2 HOW SHOULD WE TEACH CLINICAL REASONING IN UNIVERSITY?

The research findings from this study indicate that students can learn about the theory and process of clinical reasoning within the university. Parts of this process can also be tested within university, such as the knowledge required. The transfer of this theory into practice occurs during the practice placement experiences. In order to better support students to develop this difficult process and bridge the gap between the university-based teaching and the practice placement environment we could employ more simulation-based education.

Simulation is not a new teaching method, in that has been used for many years, although there has been a recent growth in more contemporary uses, particularly using technology (Gough et al 2013). Simulation is defined as an educational technique that integrates aspects of the real world to achieve specific learning outcomes (Gough et al 2013). Simulation is a technique currently used within both physiotherapy programmes with the use of paper-based and video case studies,

along with role play during practical sessions. These would be considered quite low fidelity examples as they are still very removed from a realistic situation (Galloway 2009). There is also one session for the BSc students where they are encouraged to practise their assessment and management with a patient volunteer. This would be classed as a much higher fidelity use of simulation. However it should be noted that the patients are not standardised in this session to specifically meet the learning outcomes and therefore this is less controlled simulation.

The use of high fidelity simulation could be one method to address a number of the key issues discussed by students as challenges to learning neurological physiotherapy, as identified within all of the five themes. However, specifically for clinical reasoning, simulation is appropriate to teach this process. The organisation of the simulation session could be informed by the four processes identified by Cruz et al (2012) and the additional considerations identified through this research which are specific to the neurological physiotherapy context. For example, you could develop the clinician-centred process as defined by Cruz et al (2012), where the reasoning is owned by the clinician (student). One form of input into this is information gained through questioning the patient. In this example the student could experience attempting to obtain information from a patient with Dysphasia. Another example might be to develop skills of negotiation when attempting to agree goals with a patient who has very different expectations to the therapist, complicated further by different family expectations. This example could be developing the context dependent process as defined by Cruz et al (2012). The observation skills found to be a fundamental assessment process in the clinical decision making of neurological physiotherapists by Plummer (2006) could also be practised within a clinical simulation set up prior to practice placements.

Simulation can take the form of a mannequin equipped with all the supportive computer technology to simulate a realistic scenario. This has proved very useful in the context of cardiovascular and respiratory physiotherapy as the biomedical parameters can be controlled and manipulated in response to students' interventions. These high fidelity human simulation scenarios have been used in teaching for physical therapists that are learning decision making skills for the intensive care setting (Shoemaker et al 2009). I am not aware of a mannequin that can imitate a neurological presentation, as this would be very complex and expensive to design, so too would a neurological scenario virtual reality simulation. The use of actors or standardised patients would be the most feasible option. There is an example of high fidelity silicone simulation in nursing education in Australia where the patient is simulated and responds to students in character whilst wearing life-like silicon masks, hands and torso (Reid-Searl et al 2012). The neurological physical presentation might still be difficult to simulate even with the use of silicon and therefore the standardised expert patient appears the most feasible option to support the development of the skills, in particular the clinical reasoning process required in preparation for practice placement.

The experiences of learning neurology and neurological physiotherapy are varied and influenced by students' level of interest, motivation and anxiety about the subject. The amount of previous relevant knowledge and experience a student has influences how easy students find learning. All students find clinical reasoning challenging particularly within neurological physiotherapy which could be helped by clearer signposting of information from the beginning of the course, providing a framework to facilitate learning, and by recognising the influence of students' perceptions.

6.0 CONCLUSIONS AND IMPLICATIONS

This concluding chapter summarise the main findings of the research and the contribution of the study also with some implications from the study. I will also reflect on the limitations of the study, my engagement with the research, and my role as an educator, in addition to making suggestions for further research.

6.1 SUMMARY OF FINDINGS

The research findings indicate that neurophobia in the physiotherapy students who participated in this study was not as commonly experienced as is the case for medical students (Schon et al 2002, Flanagan et al 2007, Youssef 2009, Sanya et al 2010, Zinchuk et al 2010, Hudson 2006). In fact many students were excited about learning neurology, rather than fearing it, indicating that the level of interest was the key rather than the level of fear associated with the difficulty. This did not mean however that students found it easy; they unanimously felt that learning neurology was difficult. In particular it was the hidden nature of the neurological system that students had difficulty conceptualising, as they were unable to see or feel its structures and functions. The conceptualisation of neurology knowledge was also more difficult because it was the first exposure to the information and the students did not have any prior neurology knowledge.

The complexity of clinical reasoning in neurology was seen as daunting for students as they considered the numbers of symptoms that a patient may present, in particular the communication, cognitive and perceptual problems, and the diverse body regions involved. In order that the students can learn clinical reasoning they need the opportunity to integrate the knowledge into realistic scenarios. This is part of the reason that the practice placement experiences were unanimously considered the best environment to learn. The problem-solving

treatment approach was also a source of anxiety for some students as they were unable to find all the answers to their problems in evidence-based treatment options. Students therefore had to learn a new approach to learning. Students found it very difficult to learn through role play as they were unable to empathise with the neurological cases. It also appeared very difficult for the students to recognise the transferability of skills they had learned until late in the course and felt the blocks of specialist area teaching contributed to this.

All of these concerns were underpinned by the pressure of an inherent perception that the role of the physiotherapist is the most important in the rehabilitation of neurological patients, with the outcome of treatment having a life-changing effect on patients and their families' lives, and managing the expectations that go with this. It also appeared that these perceptions of neurological disability and the brain being complex begin long before the admission onto the course.

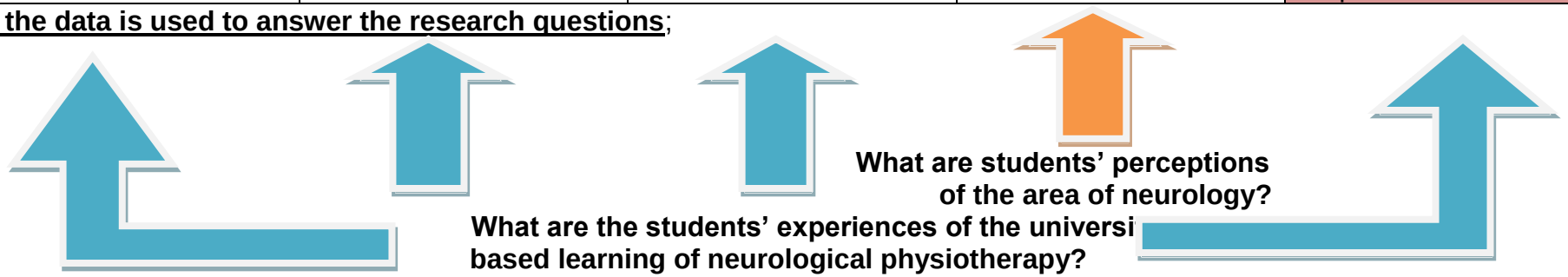
The teaching and learning experience was criticised for being too short and condensed, not allowing assimilation of information. The individual students learning needs were not always adequately addressed and more use of visual and kinaesthetic methods was requested. The overarching topic that I had not considered prior to the research was that everything would revolve around the teaching and learning of neurological physiotherapy clinical reasoning. The consideration of this learning has also highlighted how essential the consideration of both formal and informal/non-formal influences is. If there was a clearer definition of clinical reasoning specific to neurological physiotherapy, it would be more explicit for the students and provide a structure to guide the formal delivery of the teaching. A greater understanding of the informal/non-formal learning prior to the course and during the course will also provide the opportunity to guide appropriate teaching and learning situations.

Table 13 Emergent discussion themes with overriding concluding theme added.

The Formal, informal and non-formal learning of neurological physiotherapy clinical reasoning

Neurology Knowledge	Treatment Approach	Clinical Reasoning	Values and Beliefs	Pedagogy
• Conceptual difficulty as structures and functions hidden and complex/abstract • Neurology knowledge is new and unfamiliar • Level of interest is the key rather than difficulty as all areas have difficult elements	• Students struggle without a specific set of evidence based techniques • Students ability to recognise and use transferable skills	• Need to integrate knowledge to clinically reason • Placement opportunities seen as most important for learning	• Perceptions of neurology start prior to and at the start of the course • Perceived importance of the neurological PT role and the associated emotional issues	• Individuals learning needs need to be addressed in the teaching • The time and amount of teaching and personal experiences in neurology influences perceived knowledge and confidence • Difficulty in learning on normal in role play –need to see patients

How the data is used to answer the research questions;



6.2 CONTRIBUTION AND IMPLICATIONS OF THE STUDY

In this section I describe the contribution of this study to research into the topic of neurophobia and the learning of physiotherapy, the theory of clinical reasoning, and conclude this section with a discussion of the study implications.

This research has contributed to the available evidence related to the topic of neurophobia and to the best of my knowledge it is the first to consider neurophobia among physiotherapy students as opposed to medical students. It has been demonstrated that neurophobia is not as prolific among physiotherapy students in this institution but even though the majority of students do not fear neurology, they acknowledge the complexity of the subject and difficulties conceptualising. The implication of this is the need for further research to explore in more depth the reasons for this complexity in order to inform the best approach to teaching the subject. The results of this research suggest some pedagogical recommendations.

This research has also added to a growing field of evidence exploring student experiences of learning physiotherapy (Lindquist et al 2010), and neurological physiotherapy specifically in this case. Again these findings can inform future curriculum and pedagogy. Many of the findings from this research are applicable across the whole programme about the methods used to prepare students for the clinical reasoning required on practice placements. This includes acknowledging individual student's prior knowledge and experiences in order to build on these appropriately.

Physiotherapy students' perceptions of neurology and disability influence their interest in the subject. These perceptions begin long before the course starts and students' preconceptions are out of the direct control of the lecturers. The

implication of this finding is the importance of exposing these preconceptions to encourage students to reflect on these whilst leaning neurological physiotherapy. Again I feel it is important that this occurs for all physiotherapy subjects in order for the learning to be effective. The research implication of this finding is the need to explore the best methods to uncover these preconceptions and identify any individual learning needs linked to this.

Students in this research perceived that neurological physiotherapy and the interventions used are poorly defined. This makes it very challenging for students to choose and justify the use of an intervention as part of their clinical reasoning. This research therefore supports the need for further research to define the content of therapy, principles of treatment, and specific interventions and further support them with the evidence base.

Some clinical reasoning theory and models have been discussed in relation to neurological physiotherapy within this research. It is apparent that there are generic models of clinical reasoning available that are relevant to neurological physiotherapy but which do not provide the detail required for the models to be adopted within the teaching. The research highlighted the need for a clinical reasoning model specific to neurological physiotherapy that emphasises the importance of observation during assessment, and the collaboration with the patient and family/carers, the social participation, as well as the interprofessional team to plan treatment. The implications of this finding is the assumption that clinical reasoning will have different requirements for different areas of physiotherapy and further research is needed to clarify what aspects are specific to neurological physiotherapy in order for a model to be formulated.

The most important educational theory that underpinned the whole of the students' learning experience that is underestimated by the teaching team was the influence of non-formal and informal learning prior to the course, during the university based teaching and the practice placement experiences. The planning of teaching focuses primarily on the formal aspects and inadequately acknowledges the important influence of the non-formal and informal learning that the students are experiencing. The practical implications of this for the teaching team are to find methods to reflect on this learning as it occurs and to structure the learning environment with this in mind. The research implication is to conduct further research to investigate the influence of the non-formal and informal learning and try to discover how, when and why this occurs.

This research supports the use of mixed methods for topics particularly where there is a body of evidence using one approach. In this research the priority was the use of qualitative research methods to explore and discuss students' experiences of learning neurological physiotherapy although all the previous research looking at neurophobia and learning neurology was quantitative research in the medical field. The use of mixed methods within this case study approach allowed the link to previous studies with some level of comparison using the survey questionnaire whilst exploring these experiences in more detail using the qualitative observation and interview methods.

As a profession there is a need for physiotherapy to clearly define neurological physiotherapy and disseminate this to the public. This work has already begun and the public perception of physiotherapy is improving although more work is needed to ensure that students' are attracted to the profession by more than just the musculoskeletal perception of the role.

All the students' involved in this research recognised that practice placement was the most important and effective environment for learning neurological physiotherapy but there was an expectation that they would also get this equivalent experience within university. The implications of this are that it is the responsibility of the course team to educate and reinforce to students that they will get the theoretical perspective in university and the active experiential learning will happen on placement. The learning that occurs during practice placement is so rich because the context allows for a wealth of informal and non-formal learning specific to neurological physiotherapy to support the formal learning. It is important that students are able to appreciate this.

The more practical implications that emerged from the study findings which are relevant to the institution being studied but may well also be relevant to similar institutions included;

- The need to integrate neurology teaching from the beginning of the course and explore any preconceptions early in the course.
- Use a variety of methods to conceptualise neurology knowledge, such as brain models.
- To use expert patients or realistic scenarios/videos as much as possible to allow the experiential learning.
- To allow adequate time to learn which will include greater teaching time but also time between the teaching sessions, rather than doing this teaching in a very short block in year 2 of the courses.

6.3 REFLECTION ON THE LIMITATIONS OF THE STUDY

This study has a number of limitations. These limitations are linked to my development of research skills, the requirements of the doctoral research, the chosen methodology and the data analysis method.

It is possible that my varying confidence in my understanding of the approaches may well have influenced the results. It is evident in the methodology section that I had a struggle to define and confirm my methodological approach which may have influenced the early decisions made which formed the foundation of the research that unfolded. The bulk of the data collection was achieved through interviews and there are potential biases and influences to be considered in the conduct of these interviews. I was confident about the topic to be discussed and felt at ease welcoming the students and asking the questions although I am sure my interview technique improved towards the later interviews. I am very conscious that prolonged silences make me feel uneasy, and although I tried to leave the time for students to process their answers, I may have interrupted too early and missed some pertinent information. The potential influence of the lecturer-student roles was never far from my mind and I was always keen to remind the students that they could be open and honest about their experiences and this would not influence their student experience. Having said that, the students that I was more familiar with were the ones that I felt more relaxed around, and therefore may have acted differently to the students who were less familiar. I also had to constantly remind myself that the interviews were an opportunity to hear the student's experiences and not answer their queries and concerns regarding the teaching. When I reflected on the interview experiences I can recall examples where I had tried to answer the student's queries rather than allowing the student to use their

own recall of experiences to prompt their comments and this may have stilted the flow of information from the perspective of the student. I was aware of this during the earlier interviews and therefore attempted to prevent this happening in the latter interviews. This is one example of when it might have been beneficial for the interviewer to not be part of the teaching team because had I not have been part of the team I would not have known the answers to their concerns and the interviews may have been more student led and inductive.

The research procedure was designed to match the timescale requirements of the doctorate and therefore the data collection had to be performed across a specific time period which excluded the consideration of some approaches. Had I had the luxury of being time unlimited a longitudinal study following students from admission through to graduation would have provided more credible results through greater internal validity and depth (Trochim 2006). This would have required 2 years of data collection for the MSc students and a 3 year data collection phase for the BSc students. This was not achievable in the timeframe available. The confirmability (Lincoln and Guba 1985) was also difficult to achieve consistently for all students because those who had graduated without leaving forwarding addresses were inaccessible to perform member checking of the interview transcripts.

The purpose of this research was to explore students' experiences of learning neurological physiotherapy in this UK institution and it's hoped that the results are transferable to other institutions. However, strictly speaking any findings and recommendations are confined to this university. Other researchers may recognise the work that has taken place to ensure the dependability (Trochim 2006) of the

research and make their own judgements about how transferrable the results are to their own institutions.

The final limitation I wish to note is the use of NVivo during the data analysis phase of the research. This is again linked to my development as a researcher and limited experience of data analysis, along with unfamiliarity with the software. I opted to use NVivo following an introductory training session. I was attracted to the idea of some of the coding management systems and the reports that could be produced although in reality I did not have the time required to learn about the software in addition to the time that was already required to perform the data analysis. Having listened to all the audios of the interviews and transcribed the majority of them I thought that coding the remaining interviews directly from the audio would be a time saving exercise. This did not turn out to be the case because every time I wanted to look at the code/quote I had to re-listen to the audio clip and if I chose to use this quote as evidence in the write up then I still had to transcribe the clip. It also meant that I was unable to print out all the quotes under each code and category and also made some of the search functions in NVivo which should assist in the data analysis defunct because the text was only available for some of the interviews to search. Although even in light of this, the use of NVivo did assist in organising the codes and recording the number of times the code was used and by how many interviewees. So there were some benefits, although there could have been many more. I acknowledge that I did not fully understand the software and the set of tools provided by the developers of NVivo (Bazeley 2008) were not fully appreciated to assist my qualitative data analysis.

6.4 REFLECTION ON THE PROCESS OF ENGAGING WITH RESEARCH

I now have the opportunity to retrospectively reflect on my engagement in the research process and consider how I influenced the research and how the research influenced me. As I embarked on the research process as a new parent and balancing my career aspirations and parenting aspirations I really did not appreciate how much time and dedication the process would involve. It seemed to me that there was ample time to spread the stages across initially, although the time was quick to pass and the demands increased exponentially from both important roles in my life.

My passion for neurological physiotherapy as my area of clinical expertise, my desire to improve the quality of life of patients with neurological conditions and my commitment to teaching students neurological physiotherapy have always been the driving force for this research. The need to constantly reflect on this stance and the potential that this might influence the research and its results have always been at the forefront of my mind at all stages.

The topic for the research and the questions were defined using my experiential knowledge as a student, neurological physiotherapist and lecturer, and also following a review of the literature. I have a genuine interest in the students experiences of the teaching prior to going out on their practice placements. An increased understanding of this experience will ultimately inform my practice as a lecturer.

My desire initially to develop an ethnographic research study and the realisation of the demands of the thesis and the demands of employment led me to the pragmatic decision to use a case study approach instead. If I had been more

aware of the phenomenography approach before embarking on the research I may well have been guided by this approach particularly in light of its strong educational focus in understanding how students conceptualise knowledge and well defined steps for analysis (Larsson & Gard 2006).

The use of questionnaires was not a method I had envisaged using as part of this study initially. However it was a familiar method from my previous studies, and although the use of a medical questionnaire required some adaptation and only produced limited data, it was a good link to the background medical literature.

I was very excited about the observations that I performed of neurology teaching, as I felt sure this would provide a wealth of data. I was mildly disappointed when the observed comments and behaviours appeared quite ordinary. It was a very similar experience to the peer observation of teaching that I had performed previously and there was nothing to suggest that students responded to neurology topics very differently to any other subject. This could of course be my lack of experience in observation skills as this was the first time I had used this data collection method and I may have missed some important cues. I wonder whether I was unable to move between the general picture which I was very familiar with and the detail involved in observations (Hyde 2006). If I had not been familiar with the general activity in the classroom I wonder if I would have seen more detail. The observations and reflections during my own teaching were much more fluid and natural because they were motivated by an emotional response to the behaviours, actions or comments of the students. This does potentially mean that the observations chosen were biased, although I was conscious to only include them if they were observations that were typical of the groups and if it appeared they were relevant in answering the research questions.

The interviewer role was one I felt at ease with as discussed above although I regularly to reflect on my influence on the results. When I listened to some of the early interviews I could hear how much more enthusiastically I was responding to comments that corroborated my thoughts about why neurology is a difficult subject to learn and actually shared my thoughts in one example and therefore needed to modify my technique in subsequent interviews to appear more neutral. Kvale (2010) also highlights that the way the interviewer reacts after an answer may be just as important as the quality of the question posed.

I clearly remember a sense of great achievement at completing the data collection phase, quickly followed by an immense feeling of being overwhelmed by the data analysis phase. This was not helped by the decision to utilise the NVivo software package as discussed above. During the analysis I tried very hard to avoid making early hypotheses (Silverman 2011) by looking for what I thought would be there. In fact I found that the aspects that I was drawn to the most were the issues I had not previously considered. When the categories started to emerge from the codes I went through a phase of panic, as all that I had found, I had either considered myself prior to the research or was not new to me having been through the experience myself. So it all made sense and was familiar to me. My reaction then was that I didn't have any interesting data to discuss. With the help of my supervisor I realised that there was plenty to discuss and that, although I might be familiar with many of the findings, these had not been published in the literature.

The final, yet most enduring task of the process was writing this thesis. This has been the biggest challenge. My ability to tie together all the threads of information into a cohesive argument, and my writing skills has truly been put to the test. My commitment, time management, and endurance have also been assessed. This

whole process has taught me a number of important lessons which I will take forwards from this.

I recognise that conceptualisation of new information is very often a challenging process and now I can empathise even more with the students I have studied.

6.5 HOW THE RESEARCH HAS INFLUENCED MY EDUCATOR ROLE

As an educator I believe I have always offered teaching situations that addressed the individual needs of students, using a mix of styles of learning in the form of reading material prior to sessions, visual props and videos, discussing the information, and kinaesthetic practical application of information. However I have greater appreciation now of the methods of delivery being explicitly linked to the type of information being learned. For example, to learn practical skills it is essential that these are taught kinaesthetically, although the techniques taught will be learned in the context of normal as they practise on each other. In addition to this, I will now ensure that all information is presented in the context of the neurological patient and the neurological physiotherapy clinical reasoning skills they are developing. This is important because students in their second year of training do not necessarily have the advanced skill to recognise the transferability of knowledge and skills without specific signposting.

I can recall examples where I have been left feeling quite frustrated by the students reaction to my practical teaching sessions because, as much as I have tried enthusiastically to get the students to understand, they have not appeared to have understood. Having completed this research I can acknowledge that the students' engagement with the learning is influenced by much more than just the formal teaching that I provide. As a result of this, my attempts to facilitate the

students to learn will go beyond adapting my approach and formal teaching methods. I will place greater emphasis on exploring the prior experiences that students may have had and the assumptions and perceptions that students may have developed outside of the formal teaching and prior to the course. I must also appreciate that not all students will have the same amount of passion for neurological rehabilitation that I do.

6.6 SUGGESTIONS FOR FURTHER RESEARCH

The suggestions I have for further research are based on my experiences of the research process and the reflections on the limitations. It is clear that this research is just the beginning of exploring students' experiences of learning neurological physiotherapy and with the lack of previous research, further research into this topic area remains justified. Further studies are also required to determine the best pedagogy to improve the students' learning experiences.

6.6.1 FUTURE RESEARCH

In order to gain a sense of whether these views and experiences are specific to the context of learning neurological physiotherapy in the participating HEI or common to other courses, it would be interesting to research physiotherapy courses across all HEI's in the country. In particular, the survey component of the research would be the most efficient to administer. This could be managed via email and post, following approval by the relevant ethics committees.

One of the recommendations from my research is that a neurological physiotherapy specific model of clinical reasoning is needed to aid teaching and learning. Cruz et al's (2012) musculoskeletal specific clinical reasoning processes,

as defined by students, were relevant to students learning neurological physiotherapy clinical reasoning. However, there were a number of additional neurology specific considerations highlighted by students in my research that were not fully addressed within these processes. Therefore, another avenue for future research to build on the findings of my research and the Cruz et al (2012) research could be to conduct student focus group research similar to that of Cruz et al (2012), but specific to neurological physiotherapy clinical reasoning in the participating HEI. This would promote discussion regarding the confirmation or enhancement of the Cruz et al (2012) clinical reasoning processes in the context of students learning neurological physiotherapy clinical reasoning.

Having completed this research it is clear that students struggle to learn neurological physiotherapy in university in preparation for their practice placements. Many of the reasons for this relate to students being unfamiliar with the presentation of neurological patients and therefore being unable to role play this during practical teaching sessions, even with the support of video examples. When embarking on this research, one of the initial purposes was to explore students' experiences which would ultimately inform future changes to my teaching practice. The use of role play in the context of the participating HEI is a form of simulation, as the students are being asked to act out being a stroke patient for example. The problem with this type of role play is that it has limited fidelity (Galloway 2009) because the student role playing the patient is unable to act out a realistic real life situation. This means that the student role playing the physiotherapist is unable to practise how they would react in a real situation. The most positive feedback from students is always received following the one patient session that the BSc students experience before going out on practice placement. In the light of all of this, future research could include the introduction of a more

high fidelity form of simulation such as the simulated learning environments (SLE) used in Watson et al's (2012) study. In Watson et al (2012) research, two RCTs were conducted to determine effects on physiotherapy student achievement of clinical competencies when replacing one week of traditional clinical placement with SLE. The results demonstrated that student achievement was no worse in the SLE group than the traditional group. These simulated learning environments use standardised patients in the teaching, who are either actors trained to simulate a patient's illness or actual patients who present their illness in a standardised way. The later could be more authentic because it is very difficult to act out certain neurological symptoms, such as changes in muscle tone for example. Future research could evaluate the introduction of SLE as a more effective use of university practical teaching time to prepare for practice placement, rather than as a replacement for practice placement time, as was the case for Watson et al (2012).

It is also a possibility within the participating HEI that a comparison of teaching approaches could be conducted as a future research project. The comparison between the MSc programme using a purely EBL approach and the BSc more traditional blended approach specific to learning neurology could be explored in much more detail. I do acknowledge however that the neurology component of both programmes is very similar in its delivery, particularly the practical teaching. A comparative analysis of teaching methods could also be conducted. This could include the current practical session teaching methods employed such as low fidelity role play of case studies and use of video along with methods advocated in this research, such as high fidelity role play using expert patients e.g. SLE. The other practical implications of my research such as the earlier introduction to neurology to explore preconceptions; use of models; greater use of video and

patients; allowing more time during and between sessions will be evaluated through the usual module monitoring processes. These areas could also offer the opportunity to conduct an action research study.

Finally, as previously stated, there is a need for longitudinal studies to follow students through the full learning experience of the course utilising an ethnographic or phenomenographic approach with methods such as observations and interviews. This would allow exploration of the changes in perceptions and experiences through the course, and the key influences on this professional development.

A FINAL NOTE

All of the data and emergent themes have direct relevance to the learning of the assessment and treatment of neurological patients. In essence, the goal of the university teaching of neurological physiotherapy is to give students the tools to perform effective **clinical reasoning** with neurological patients on their practice placements. The challenge for university lecturers is teaching neurological clinical reasoning, taking into account the formal, informal and non-formal influences, and without the patient being present. I feel enthused to consider different models of clinical reasoning in neurological physiotherapy and different methods of delivering the teaching. I hope that this research has stimulated some debate about challenges to achieving this and provided some useful implications for higher education practice.

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Appendix 1

Search terms

Early wide scope search term examples;

‘neurophobia’

‘physiotherap*’

‘learn* physiotherap* OR physical therap*’

‘teach* physiotherap* OR physical therap*’

‘student experience’

‘healthcare student’

‘neurolog*’

‘university’

‘vocational’

‘professional*’

‘knowledge conceptualisation’

‘neurolog*’

These search terms were combined with Boolean operators; AND, OR, NOT. For example, ‘NOT placement’ was used to exclude students experiences of learning during practice placement and to remain focused on the university based learning and teaching.

Later examples of more focused searching included;

‘clinical reasoning AND physiotherap*’

‘professional socialisation AND physiotherap*’

‘university AND formal learning AND health*’

‘evidence-based practice AND physiotherap*’

‘university AND prior learning’

Databases used

Database	Justification
ERIC	Considered to be the primary database for educational literature.
CINAHL – The cumulative index to Nursing and Allied Health literature. AMED – Allied and Complimentary Medicine Database Pubmed/Medline – produced by US national library of medicine. PEDro – Physiotherapy Evidence Database Cochrane library – The NHS centre for reviews and dissemination	Health related databases

Other methods used to access literature

Use of core neurology textbooks recommended on the courses.

Searching reference lists of selected articles

Articles recommended by colleagues.

Example of search for relevant background for scoping students experiences of learning neurological physiotherapy;

Learn* AND physiotherap* = 2104

Learn* AND physiotherap* AND student = 561

Learn* AND physiotherap* AND student AND neurolog* = 325

Learn* AND physiotherap* AND student AND neurolog* NOT placement = 287

Appendix 2

Kelly Walker (RSC)

From: Watson Jacqueline Dr (EDU)
Sent: 09 May 2011 18:02
To: Walker Kelly Mrs (AHP)
Cc: Corby Dawn Mrs (SSF); Leaton Gray Sandra Dr (EDU)
Subject: Ethics application

Follow Up Flag: Follow up
Flag Status: Flagged

Dear Kelly,

Thank you for your application to the EDU research ethics committee. At its meeting today, the committee approved your application and you can begin your research.

The committee felt that this was a particularly well constructed ethics proposal and that ethical issues were discussed thoroughly and sensitively. We would like to suggest that, although the MSc students analysis of each others' interviews was a strength of the research design, this may need to be handled carefully by yourself as researcher, so that students do not stray from the research questions into more sensitive areas.

We thought that the participant information sheet was particularly well written and would like to ask if we can use it as an example on the EDU ethics website.

With best wishes, Jackie.

Dr Jacqueline Watson
Chair EDU Ethics Committee
Centre for Applied Research in Education School of Education and Lifelong Learning University of East Anglia
Norwich NR4 7TJ, UK

Email: Jacqueline.Watson@uea.ac.uk
Telephone: +44 (0)1603 592924

Appendix 3

Participant Information Sheet (Version 1)

Date:

You are being invited to take part in a research project. Before you decide it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask me if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.
Thank you for reading this.

Research Title:

Physiotherapy students' attitudes and experiences of neurological physiotherapy.

What is the purpose of the research?
The purpose of the research is to explore physiotherapy students' experiences, thoughts, feelings and assumptions about neurology and learning neurological physiotherapy. The results of the research will help to inform changes to the delivery of teaching and improve the students' overall experience of learning neurological physiotherapy.

Why have I been chosen?
All current physiotherapy students at the UEA have been invited to participate. It is hoped that 5 student volunteers from each year will be interviewed. The interview is only expected to last approximately 45 minutes and will form part of a research study spanning 6 months.

Do I have to take part?
It is up to you to decide whether or not to take part. Refusal to take part will involve no penalty. If you do decide to take part you will be given this information sheet to keep and be asked to sign a consent form. If you decide to take part you are still free to withdraw at any time immediately by giving notification via email or phone and without giving a reason.

What will happen to me if I take part?
Neurology teaching and learning for physiotherapy students will be intermittently observed over a 6 months period (September 2011-March 2012). During this time a selection of interviews will also be taking place with students from each of the cohorts. You will only need to attend 1 interview of approximately 45 minutes duration. The interviews will normally take place in a university office however this is flexible and they can be arranged at a convenient time for yourself and in a location you feel comfortable with. If you are a BSC student you will be interviewed by the researcher and if you are a MSc student you will be interviewed by a fellow student and supervised by the researcher. You will be asked some very open, general questions in order to get your

thoughts about neurology. The interviews will be recorded so that they can be more accurately transcribed in preparation for analysis. You will be given a copy of the transcription and analysis to which you can add any comments you would like to make.

What are the possible disadvantages of taking part?
There are no anticipated disadvantages to taking part in this research apart from the fact that you will need to allocate some precious time to attend the interview. If for any reason you feel uncomfortable during the interview or do not wish to continue a topic of discussion you only need to say and the topic will be changed or the interview terminated without question.

What are the possible benefits of taking part?
Whilst there are no immediate benefits for those people participating in the project, it is hoped that this work will provide valuable information about physiotherapy students' experiences of neurology and can inform choices about the delivery of teaching.

Will my taking part in this project be kept confidential?
All information which is collected about you during the course of the research will be coded and kept strictly confidential in a locked filing cabinet, for which only the researcher has a key. Any information which is subsequently written up or published will be done so in such a way that you cannot be identified.

What will happen to the results of the research project?
The results of the study will be written up in my doctoral thesis which is due to be submitted in 2013. If you wish to see a copy of the completed thesis I will be more than happy to share this with you at a later date if you provide relevant contact details. The results will also be written up for publication in an appropriate peer reviewed journal and presented at a relevant conference.

Who is organising and funding the research?
This research is being self-funded by the research as part of a doctorate in education.

Who has reviewed the project?
The appropriate research ethics committees will review the project proposal. The primary supervisor of the project will also be part of the review process.

Contact for further information

Kelly Walker
Queens Building 1.09
Kelly.walker@uea.ac.uk
01603 592346

Many thanks for taking the time to read this.

This participant information sheet is yours to keep. If you choose to take part in the research you will also be given a copy of the signed participant consent form.

Appendix 4

Participant Consent Form

Title of Project:

Physiotherapy students' attitudes and experiences of neurological physiotherapy.

Name of Researcher:

Kelly Walker

Please initial box

1. I confirm that I have read and understand the information sheet dated ..... (version .....) for the above study and have had the opportunity to ask questions. ☐

2. I understand that my participation is voluntary and that I am free to withdraw at any time giving notification via email or phone and without giving any reason. ☐

3. I agree to take part in the above study. ☐

_____ _____ _____

Name of Participant Date Signature

_____ _____

_____

Name of Person taking consent (if different from researcher) Date Signature

_____ _____

_____

Researcher Date Signature

_____ _____

_____

1 copy for participant, 1 copy for researcher.

Appendix 5

PHYSIOTHERAPY QUESTIONNAIRE

Your participation in this survey is voluntary and anonymous. Whether you participate or not, will not in any way influence your teaching and learning experience. You may skip questions for any reason. Completion and return implies consent.

We are attempting to highlight areas of difficulty among physiotherapy students in an effort to inform changes to the teaching.

Please Circle choices for questions below.

1. **How would you describe your knowledge in the following areas of Medicine**

	Very Limited	**Limited**	**Moderate**	**Good**	**Very Good**
Musculoskeletal	1	2	3	4	5
Neurology	1	2	3	4	5
Cardiovascular & Respiratory	1	2	3	4	5

Please describe briefly the reasons for which you circled the above scores

2. **How would you rate each of the following subjects in degree of difficulty?**

	Very Difficult	**Difficult**	**Moderate**	**Easy**	**Very Easy**
Musculoskeletal	1	2	3	4	5
Neurology	1	2	3	4	5
Cardiovascular & Respiratory	1	2	3	4	5

Please describe briefly the reasons for which you circled the above scores

3. **How would you describe your interest in the following areas of Medicine**

	Very Limited	Limited	Moderate	Interested	Very Interested
Musculoskeletal	1	2	3	4	5
Neurology	1	2	3	4	5
Cardiovascular & Respiratory	1	2	3	4	5

Please describe briefly the reasons for which you circled the above scores

4. **How confident would you be in assessing, diagnosing and treating patients presenting with problems related to each of the following specialties?**

	Very Uncertain	Uncertain	Moderately Confident	Confident	Very Confident
Musculoskeletal	1	2	3	4	5
Neurology	1	2	3	4	5
Cardiovascular & Respiratory	1	2	3	4	5

Please describe briefly the reasons for which you circled the above scores

5. Neurology is often perceived as a difficult subject. The following are sometimes mentioned as reasons for the difficulty. How would you rate these reasons?

	Not at all	A Minor Contributor	A Major Contributor
Neuroanatomy	1	2	3
Neuropathophysiology	1	2	3
Complexity of treatment approach	1	2	3
Poor Teaching	1	2	3
Many Complex Diagnoses	1	2	3
Limited Exposure to Neurological Patients	1	2	3
Not Enough Teaching	1	2	3

Please List any other reasons why you think Neurology is a difficult subject.

_____
_____
_____
_____

6. How do you think students could be facilitated towards overcoming this difficulty?

_____
_____
_____
_____

Many thanks for taking part in this survey, it is very much appreciated and it is hoped that the results will ultimately inform changes to the teaching which will improve the student experience.

Please return the questionnaire to me via email Kelly.walker@uea.ac.uk, pigeon hole in Queens Building reception or my office 1.09.

Appendix 6 Copy of questionnaire used by Flanagan et al (2007).

Study ID: Questionnaire 1 of 12 Page

Date of Birth : d d m m y y y y (1) Gender : Male 1 Female 2

Are you a, Doctor ☐ Medical Student ☐

Q1 What is your level of preference for each of the following specialties?
(Please circle the appropriate 1-5)

	Least favourite				Most favourite
Cardiology	1	2	3	4	5
Dermatology	1	2	3	4	5
Endocrinology	1	2	3	4	5
Gastroenterology	1	2	3	4	5
Nephrology	1	2	3	4	5
Neurology	1	2	3	4	5
Respiratory medicine	1	2	3	4	5
Rheumatology	1	2	3	4	5

Q2 What is your current level of interest in each of the following specialties?
(Please circle the appropriate level of interest 1-5)

	Not interested				Very interested
Cardiology	1	2	3	4	5
Dermatology	1	2	3	4	5
Endocrinology	1	2	3	4	5
Gastroenterology	1	2	3	4	5
Nephrology	1	2	3	4	5
Neurology	1	2	3	4	5
Respiratory medicine	1	2	3	4	5
Rheumatology	1	2	3	4	5

Q3 List below mentioned subjects from least interesting (1) to most interesting (7)
(Cardiology, Dermatology, Endocrinology, Gastroenterology, Neurology, Respiratory medicine, Rheumatology)

1 _____

2 _____

3 _____

4 _____

5 _____

6 _____

7 _____

Study ID: ☐☐■☐☐☐☐

Q4 What is your current level of knowledge in each of the following specialties? (Please circle the appropriate level of knowledge 1-5)

	Very low				Very high
Cardiology	1	2	3	4	5
Dermatology	1	2	3	4	5
Endocrinology	1	2	3	4	5
Gastroenterology	1	2	3	4	5
Nephrology	1	2	3	4	5
Neurology	1	2	3	4	5
Respiratory medicine	1	2	3	4	5
Rheumatology	1	2	3	4	5

Q5 What is your perceived level of difficulty in each of the following specialties? (Please circle the appropriate level of difficulty 1-5)

	Very easy				Very difficult
Cardiology	1	2	3	4	5
Dermatology	1	2	3	4	5
Endocrinology	1	2	3	4	5
Gastroenterology	1	2	3	4	5
Nephrology	1	2	3	4	5
Neurology	1	2	3	4	5
Respiratory medicine	1	2	3	4	5
Rheumatology	1	2	3	4	5

Q6 List below mentioned subjects from least difficult (1) to most difficult (7)
(Cardiology, Dermatology, Endocrinology, Gastroenterology, Neurology, Respiratory medicine, Rheumatology)

1 _____

2 _____

3 _____

4 _____

5 _____

6 _____

7 _____

Study ID: ☐☐■☐☐☐☐

Q7 What is your current level of confidence in managing each of the following?
(Please circle the appropriate level of confidence 1-5)

	No confidence				Highly confident
Abdominal Pain	1	2	3	4	5
Chest Pain	1	2	3	4	5
Cough	1	2	3	4	5
Dizziness	1	2	3	4	5
Fever	1	2	3	4	5
Headache	1	2	3	4	5
Heartburn	1	2	3	4	5
Numbness of feet	1	2	3	4	5
Shortness of breath	1	2	3	4	5

Q8 If your most difficult subject is neurology,
Why neurology was felt to be a difficult subject?
(Please circle the appropriate from 1-4)

	Strongly disagree			Strongly agree
1 The need to know basic neuro-anatomy	1	2	3	4
2 Having a complex clinical examination	1	2	3	4
3 Having large number of complex and rare diagnosis	1	2	3	4
4 Having a reputation of being difficult	1	2	3	4
5 Being poorly taught	1	2	3	4
6 Not having enough teaching time	1	2	3	4
7 Not having definitive curative treatment in most instances	1	2	3	4
8 Neurology being a complex subject	1	2	3	4

Q9 Do you feel that the following teaching strategies
will help to improve your competency in neurology?
(Please circle the appropriate from 1-4)

	Strongly disagree			Strongly agree
1 Clinical/hospital based teaching	1	2	3	4
2 Neurology lectures	1	2	3	4
3 Neuro-anatomy lectures	1	2	3	4
4 Case discussions	1	2	3	4
5 Teaching aids	1	2	3	4

Appendix 7

Interview topic guide and questions.

Example topics:

-Prior knowledge of Neurology before starting the course and any preconceptions

-Experiences of people with neurological problems

-Attitudes towards neurology teaching

-Thoughts about how difficult the subject is and why

-Thoughts about how interesting the subject is

-Ideas to improve the experience of learning neurology

Example questions:

Tell me what you understand by neurology and neurological physiotherapy

Can you tell me about how you first became aware of neurology?

Can you tell me about your experience of learning neurology?

Prior to starting the course did you have any knowledge or experiences of neurology?

How do you feel about learning neurology?

Tell me about any experiences you have had of treating neurological patients

What do you think/feel about treating neurological patients on placement?

Tell me about whether you think neurology is a difficult subject?

How interested are you in neurology?

Example prompts

-tell me more

-what do you mean by that?

-that's interesting, please go on

-why do you think that was?

Appendix 8 Examples of raw data from each of the three data collection methods with codes for ‘transferability’ within the theme ‘clinical reasoning’.

The following pages provide these examples;

Nvivo list of nodes (codes) for 'Msk underpins neurology'

(Interview analysis; code= 'Msk underpins neurology, category= 'transferability', theme= 'clinical reasoning)

<Internals\\Interview B> - § 1 reference coded [2.89% Coverage]

Reference 1 - 2.89% Coverage

with hindsight i can see a lot of my musculoskeletal forms a basis for my neurology things and like almost more and more the movement science things, it's very important that you've got optimum biomechanical situation to work from and it's less important the tonal aspects and the bobath neurodevelopmental thing, which is what i was really interested in to start with but actually i can see that by knowing how to strengthen and stretch and relieve pain you can really apply that

<Internals\\Interview C> - § 1 reference coded [2.27% Coverage]

Reference 1 - 2.27% Coverage

Once you break it all down you can draw on what you already know e.g. sit to stand ortho, shoulder sublux Msk.

<Internals\\Interview M> - § 1 reference coded [1.47% Coverage]

Reference 1 - 1.47% Coverage

because it's our first set of patient handling you almost assume it's purely musculoskeletal, I don't know why perceptions again, but I think, yes it was basics that you learn for everything. Um, and if you've got a low toned limb then you have to hold it in a specific way. If you're aiming for something else you do it differently, and, yeh, I don't know why it just seemed to feel like pure musculoskeletal but it does sort of work and come into everything.

Example interview transcript (first 20 minutes), with code ‘Msk underpins neurology’ highlighted (p 279 and 280).

KW

It will be interesting for me to hear about what has happened before you got here, so could you fill me in a little with your background?

B

Well, it was kind of neurology based rather than, i had worked at a home for children with cerebral palsy and thats why i wanted to be a physio, i didn’t really have much interest in musculoskeletal or stuff like that, that was what bought me to the course but previously i had done a molecular biology degree.

KW

Ok, so in what capacity were you working with the children?

B

Um, i was a volunteer, i was mostly in care work and in stimulation but i found myself more and more in the physiotherapy department and that’s kind of where i ended up.

KW

Ok, and if anybody had asked you at that point what neurology was or neurological physiotherapy would you have had any idea or would you have come up with any suggestion of what you thought it was?

B

Um, ...I’m not really sure actually, i guess i could mention things that we had done with or what i had seen done with the children but i’m not sure i could have given any reasoning behind why we were doing those things but i really, um...i knew i wanted to know more about the brain but i didn’t really know about how that influenced movement or the kind of things we were trying to do.

KW

So you hadn’t necessarily made the links at that point between the field of neurology and what you were do experiencing.

B

No, um yeh.

KW

What was it then that particularly interested you about working in that area?

B

Um, .i think the different presentations um... the fact that you could see that physiotherapy was having an effect um, um it was just an interesting client group, i liked working with that group.

KW

Did you find it quite easy working with that group or was it quite challenging and if so in what ways?

B

I think i was working at quite a low level, i don't think, it was just playing really, and although i have complicated it a bit by our studies i kind of, now looking at it again i realise it is what i should have been doing all along really. It's just kind of having a background behind why you are doing it, but at the time i was just doing things but without any understanding, but i think it is probably a bit more instinctive than adding too many complications to it.

KW

Yeh, that sounds about right. . Presumably before you applied for the course you did a bit of research about what PT is, at that point what did you think about the areas of physio, kind of the core areas, you tend to find out that there is musculoskeletal, respiratory and neuro, some people find out a lot more, some people limit it to that, what were your feelings about them?

B

Um, i probably didn't research it as much as i should have done, but um..

KW

What makes you say that?

B

Just that i didn't really know much about it, um i was very specific to that area, that is what interested me, um i was probably a bit narrow minded. I think i saw the musculoskeletal thing as very sports based and that didn't really interest me and i did do some observations in a hospital, shadowing and did see some respiratory but it didn't really click that that was a major role um,.. and i was aware of course about the importance of the elderly wards because of my grandparents..yeh.

KW

So how did you, musculoskeletal is your first experience in your teaching so when you started how did you feel towards it. How did you feel and did this change over time or stay the same perhaps??

B

I had quite negative thoughts, i wasn't overly enamoured with it um, i felt out of my depth um.

KW

Ok, is that because you found it difficult... or not interesting ..or.

B

I'm not sure why i felt, no it wasn't even interest, i found i was really confused by it and i felt that a lot of people in our cohort had done sports sciences and then that was definitely their interest and they knew quite a lot about it so i definitely felt i was caught on the back foot, i didn't really um ... i started off behind everyone else and it probably didn't help my attitude towards it.

KW

Yeh,

B

I found it quite confusing, i thought it theory it should be quite simple you know like you just learn your anatomy, but there were a lot of things that kept coming in, i'm trying to think of examples now...like the theories behind treatments that it wasn't as simple as that. Um ...yeh so many things came into it that i wasn't really expecting, the pain physiology and things like that, but um i didn't enjoy studying it at university, but my first placement was musculoskeletal and i loved it, i really really enjoyed it. Ye hi felt i got it, i had very good teaching on my placement and i was exposed to quite a range of patients and i really enjoyed the kind of clinical reasoning and umm the fact that you can get quite quick results in musculoskeletal, i really enjoyed that.

KW

Yes, so what was the big difference from learning it here to learning it out on placement?

B

I think, as with all the areas, its that seeing what can go wrong, like you can't, there's only so much you can do on a healthy population. And to look for dysfunction when it's not really there or to imagine what's gone wrong, if you haven't seen it you can' really do it, and you don't really see how some of the treatments can be effective until you actually do them and they do have an effect.

KW

Yeh, i mean that makes sense, it kind of what we have to do here is prepare for placement we can't obviously do everything because we can't have patients or don't necessarily have patients here so what we do is prepare. So did you feel prepared for placement?

B

Um.....not really, i didn't really know what to expect um, i think that, i'm not really sure what that came down to though, whether it was just that i hadn't embraced it enough then, maybe it was being presented to us and i just hadn't absorbed it. I'm not sure, but after a week there i was happy with it. I guess on some level i was but not consciously.

KW

Yeh, it sounds like you had the knowledge and skills and things to do well but it perhaps took a little time to perhaps transfer that knowledge.

B

It just took a while to click i think. Even things with assessment, i mean we talked quite a lot about it but it didn't really make sense in a theoretical perspective but once you did it you could see why you wree asking the questions and how they were going to be useful

KW

Ok, so if we can talk about the neurology teaching and clinical experiences, if i start here, how did you feel during your neuro teaching here?

B

Um....

KW

And if you can include all the neurology teaching, so not just the practical but the anatomy and physiology and things as well.

B

Yeh ok, um... if found it more interesting so i think i was more open to it, but i had the same thing where i struggled to see how it was going to be applied um, i think the thing through it was the lack of examples. In musculoskeletal as well as neurology i couldn't really, when there was a mass of information that's being thrown at you, unless you've got examples to kind of see which are the important bits in different cases, in the bigger picture i struggle with that thing.

KW

How did you find the type of knowledge and the type of information, and the new field of information. Did you find that quite easy to get your head around or did you find it more of a challenge than musculoskeletal or the same or...

B

I think for me the neuro physiology i was comfortable with because i'd covered it in my previous degree, but when it comes to like the normal, the normal movement teaching is what sticks in my head and i just didn't really understand what we were getting at, um i didn't really understand why we were doing it, um or really why it was helpful. I can slightly more with hindsight but i think it needed to be incorporated more with abnormal movement. I understand why they did it separately but i feel you need to understand the whole spectrum form normal to abnormal to recognise what and why normal is important.

KW

Ok yes that makes sense and that's definitely what you get on placement because you've got all the abnormal movement in front of you haven't you.

B

And i also felt i was at an advantage because i had seen some of it with the children i'd worked with.

KW

Yes, so you could reflect on those experiences

B

Yeh, and it just bought things to mind, what could go wrong i think.

KW

Yes, ok so did your thoughts and feeling s and perspectives of neurology change during your period of teaching here.

B

Um.....

KW

Because you obviously came with quite a positive, open minded interest in the area, did that change at all during the teaching?

B

I think i got a bit frustrated in that i felt is did know something before coming onto the course but i wanted more um to be given more information, i wanted to know how to deal with the problems i had seen um, and i didn't feel i got that. So, i can understand now why but at the time i was like, this isn't what i signed up for.

KW

So were you looking for like a textbook of texchniques?

B

Yes, um, even if it was the philosophy behind them, just what people did, i didn't really even know, i'd seen 1 physio working a lot but i didn't know what other people did, i didn't know how other things were done.

KW

And did that make it more challenging or just frustrating?

B

Um, i seem, i can't quite remember but i think when we were doing our neurology teaching we had quite a lot of other things on so we didn't really, it didn't stress me out so much perhaps it would have done, you know the musculoskeletal teaching was at the beginning and that was the sole focus but i think when we did neurology we were doing lots of other things to think about, i think probably had an influence as well.

KW

And did you feel there was more musculoskeletal than neuro and why do you think that might be?

B

Um i do, i think its, with hindsight i can see a lot of my musculoskeletal forms a basis for my neurology things and like almost more and more the movement science things, it's very important that you've got optimum biomechanical situation to work from and it's less important the tonal aspects and the bobath neurodevelopmental thing, which is what i was really interested in to start with but actually i can see that by knowing how to strengthen and stretch and relieve pain you can really apply that and it's actually more useful than things that go straight in at that end of things

KW

And when did you become aware of that, was it something you were aware of as you went through the teaching?

B

No, i think um until going on placement, i'm not sure i can say which placement but it's been a gradual process. And essay writing as much as i hate writing essays they do really help, you do that reflective process of incorporating knowledge, um seeing patterns and reasoning behind things.

KW

No that's good, it concerns me that students often see a division between that 's all musculoskeletal and that's all neuro, we don't do as much neuro as we do musculoskeletal why is that sort of thing and don't necessarily see the transferability of the skills from what you might call basis physio skills rather than musculoskeletal. This is one of things that would be really useful to make transparent in the teaching for the students from the beginning.

B

Yes

KW

So trying to reflect on your experiences of the learning academically here for neuro, how do you think that prepared you for placement, neuro placement?

B

Um that's quite difficult to answer only because um my neuro placement was my last placement, although it was my first observational one as well. I felt very under prepared for my first one, i felt i didn't know anything about neuro assessment and that is obviously very much the basis, and i know we had been taught a musculoskeletal version of assessment but i wasn't really aware of the ways that you could then apply that to a neuro patient, um and i think that was my main sticking point, 'i don't know how to do this'. All the way through probably, even in my final placement.

KW

How did you deal with that?

B

Um,.....i suppose by um through teachings on placement, um reading as much as i could, um, i think the first summer i had my 3 week observational placement and i perform a couple of assessments but felt very out of my depth but then after doing outpatients and getting quite comfortable with doing subjective and objective assessments it then was a lot easier and i still don't think i was particularly good with neuro but i just didn't have that experience um but it was easier in my mind to know what i was doing, that kind of structure.

KW

If you felt quite confident with musculoskeletal assessment why do you think you felt out of your depth with neuro assessment?

B

I think it's the kind of global aspect of it. I think with musculoskeletal you focus on just one area, so you focus on just a shoulder and also that underlying thing, it could be something we could quite easily treat, but if you are talking about a stroke um, you're not going to have an impact on the actual cause of whatever's gone wrong, like you can treat symptoms, so that trying to get to the bottom of it and also you probably you know a bit more about your neuro patients when you first see them. I suppose also the fact that they are a lot sicker often, well in sense that i saw them in acute neuro.

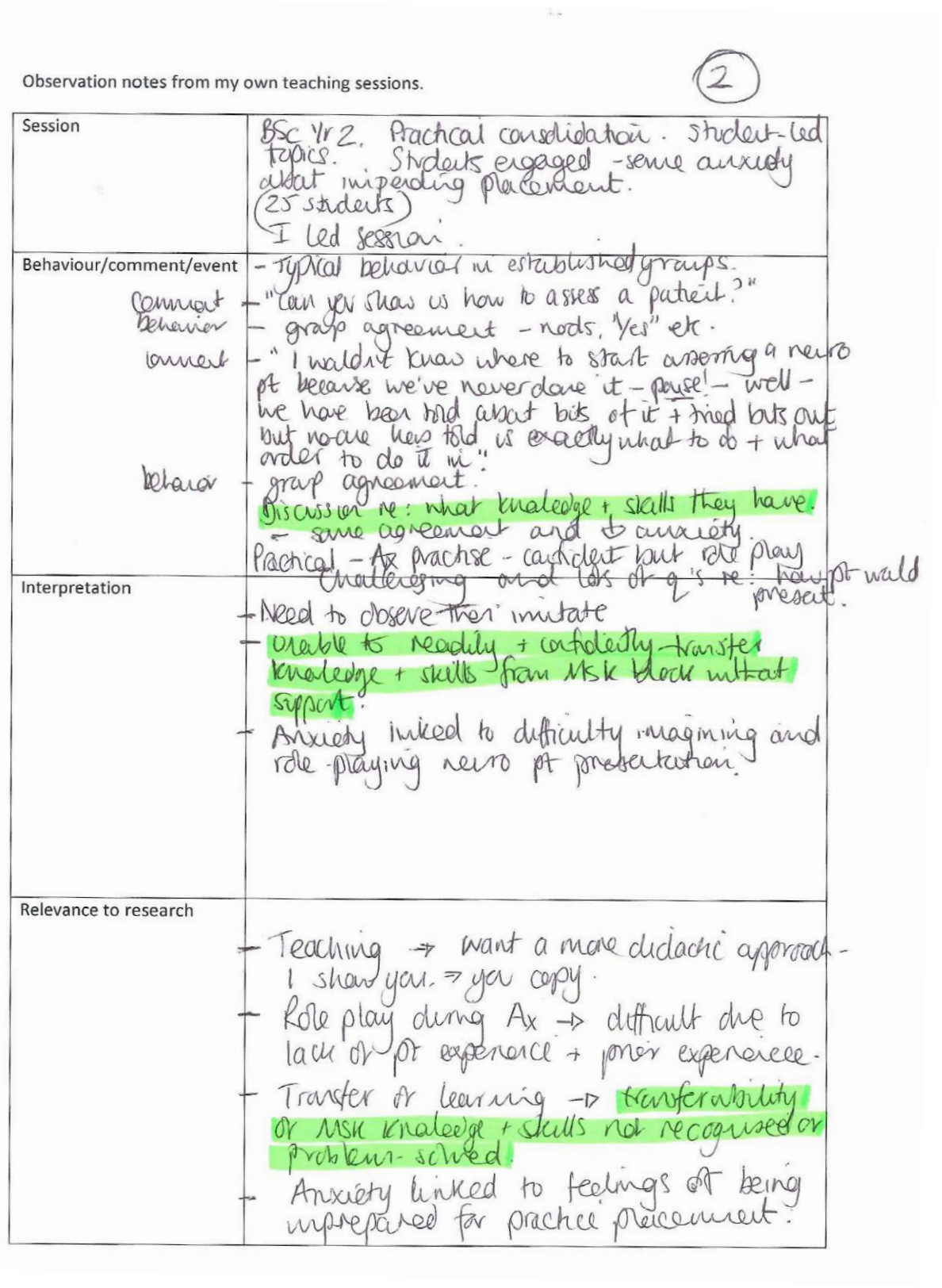
KW

So which, do you, which area would you say is more complex and why, personally?

B

Yes, um .....i think in my own head i found it easier to simplify neuro, um i think, i feel like musculoskeletal is very technical and very um, if it's going to be good it's got to be specific. I think you can have a lot more global success with techniques that are quite general really, which is awful but um as long as you get people moving you can get results. It's obviously better if you're specific and know exactly what you are looking for and why, but you could get those results anyway, like you could get to that end. Um yeh i don't know, was it more complex, was that the question.

Scanned example of observation notes with interpretation demonstrating ‘transferability’ within ‘clinical reasoning’.



Observation notes from my own teaching sessions. (2)

Session	BSc Yr 2. Practical consolidation. Student-led topics. Students engaged - some anxiety about impending placement. (25 students) I led session.
Behaviour/comment/event	- Typical behaviour in established groups. Comment behaviour - "Can you show us how to assess a patient?" - group agreement - nods, "Yes" etc. comment - "I wouldn't know where to start assessing a neuro pt because we've never done it - pause! - well - we have been told about bits of it + tried bits out but no one has told us exactly what to do + what order to do it in". behaviour - group agreement. Discussion re: what knowledge + skills they have. - some agreement and ↑ anxiety. Practical - Ax practise - candidate but role play challenging and lots of q's re: how pt would present.
Interpretation	- Need to observe then imitate - Unable to readily + confidently transfer knowledge + skills from MSk block without support. - Anxiety linked to difficulty imagining and role-playing neuro pt presentation.
Relevance to research	- Teaching → want a more didactic approach - I show you. ⇒ you copy. - Role play during Ax → difficult due to lack of pt experience + poor experience. - Transfer of learning → transferability of MSk knowledge + skills not recognised or problem-solved. - Anxiety linked to feelings of being unprepared for practice placement.

Example of questionnaire returned electronically

BSc Yr 3

PHYSIOTHERAPY QUESTIONNAIRE

Your participation in this survey is voluntary and anonymous. Whether you participate or not, will not in any way influence your teaching and learning experience. You may skip questions for any reason. Completion and return implies consent.

I am attempting to highlight areas of difficulty among physiotherapy students in an effort to inform changes to the teaching.

Please Circle choices for questions below

1. **How would you describe your knowledge in the following areas of Physiotherapy**

	Very Limited	Limited	Moderate	Good	Very Good
Musculoskeletal	1	2 !!!!!	3	4	5
Neurology	1	2	3!!!!!	4	5
Cardiovascular & Respiratory	1	2	3!!!!!	4	5

Please describe briefly the reasons for which you circled the above scores	MSK was a long time ago and have since forgotten most of the deltailed information Eg muscle attacment and nerve supply	Neuro, teaching was a long time ago and since then have been focusing on resp. At the end of each placement I felt comfortable in that field but cannot cross between the areas as they are still very separate in my memory	Resp im on placement and finding out how very detailed it is and don't feel confident

and
understanding

1. How would you rate each of the following subjects in degree of difficulty?

	Very Difficult	Difficult	Moderate	Easy	Very Easy
Musculoskeletal	1	2	3 !!!!!	4	5
Neurology	1	2!!!!!!!	3	4	5
Cardiovascular & Respiratory	1 !!!!!!!	2	3	4	5

Please describe briefly the reasons for which you circled the above scores	As long as I am being safe within the relms of my practicing they are only as hard as my educator makes them.

3. How would you describe your interest in the following areas of Physiotherapy

	Very Limited	Limited	Moderate	Interested	Very Interested
Musculoskeletal	1	2	3	4 !!!	5
Neurology	1	2	3!!!!!	4	5
Cardiovascular & Respiratory	1	2!!!!1	3	4	5

Please describe briefly the reasons for which you circled the above	MSK is the easiest for me to clinically	Neruo Stroke victims seem to

scores	reason	heal themselves

4. How confident would you be in assessing, diagnosing and treating patients presenting with problems related to each of the following specialties?

	Very Uncertain	Uncertain	Moderately Confident	Confident	Very Confident
Musculoskeletal	1	2	3	4!!!!	5
Neurology	1	2!!!!!	3		5
Cardiovascular & Respiratory	1!!!!	2	3	4	5

Please describe briefly the reasons for which you circled the above scores		Personally I learn best via patient mileage, MSK is the most physical and seemingly straight forward of the 3 disciplines	Neuro, I only worked with stroke patients

7. Neurology is often perceived as a difficult subject. The following are sometimes mentioned as reasons for the difficulty. How would you rate these reasons?

	Not at all	A Minor Contributor	A Major Contributor
Neuroanatomy	1	2 !!!!!	3
Neuropathophysiology	1	2 !!!!	3
Complexity of treatment approach	1 !!!!!!	2	3
Poor Teaching	1 !!!!!!	2	3
Many Complex Diagnoses	1	2!!!!!!	3

Limited Exposure to Neurological Patients	1	2	3!!!!!!
Not Enough Teaching	1	2 !!!!	3

Please List any other reasons why you think Neurology is a difficult subject.

I personally find Nero and resp equally difficult, normally msk patients are a lot more medically stable than neuro or resp, so they are easier to sub and objectively examine.

8. **How do you think students could be facilitated towards overcoming this difficulty?**

Restructing the placements.

MSK good, Learn anatomy etc go on to placement, excellent.

Neruo and Resp learn in succession, then you're lucky if you get a resp place.

Learning the two areas in the same way as the msk, eg teaching then a direct placement surrounding that area.

Also I have only worked with stroke patients so have no idea if the skills I have learned are transferable to any other neuro based working environments.

Many thanks for taking part in this survey, it is very much appreciated and it is hoped that the results will ultimately inform changes to the teaching which will improve the student experience.

Please return the questionnaire to me via email Kelly.walker@uea.ac.uk, pigeon hole in Queens Building reception or my office 1.09.